Lotus® software

IBM

IBM Workplace Forms 2.6

Guide to Building and Integrating a Sample Workplace Forms Application

Designing with XForms Model

Features and functionality

Integration

Philip Monson
Ed Dussourd
Cayce Marston
Andreas A. Richter
George Poirier
Manny Santana

Redbooks

ibm.com/redbooks

International Technical Support Organization

IBM Workplace Forms 2.6: Guide to Building and Integrating a Sample Workplace Forms Application

May 2007

SG24-7388-00

Note: Before using this information and the product it supports, read the information in “Notices” on page xi.

First Edition (May 2007)

This edition applies to Version 2.6.1 of IBM Workplace Forms.

Contents

Notices

Trademarks

Preface

This IBM® Redbooks® publication describes the features and functionality of Workplace™ Forms 2.6 and each of its component products. After introducing the products and providing an overview of features and functionality, we discuss the underlying product architecture and address the concept of integration.

To help potential users, architects, and developers better understand how to develop and implement a forms application, we introduce a specific scenario based on a *sales quotation approval* application. Using this base scenario as a foundation, we describe in detail how to build an application that captures data in a form, then applies specific business logic and workflow to gain approval for a specific product sales quotation.

Throughout the scenario we build upon the complexity of the application and introduce increasing integration points with other data systems. Ultimately, we demonstrate how an IBM Workplace Forms™ application can integrate with WebSphere® Portal, IBM DB2® Content Manager, and Lotus® Domino®.

The team that wrote this book

This book was produced by a team of specialists from around the world working at the International Technical Support Organization, Cambridge Center.

Philip Monson is a Project Leader at the ITSO Lotus Center in Cambridge, MA. Phil has been with Lotus/IBM for 16 years, joining the company when the early versions of Notes were rolled out for internal use. He has served in management, technical, and consulting roles in the IT, Sales, and Development organizations.

Cayce Marston is a Senior IT Specialist within the IBM Worldwide Technical Sales team. He joined IBM as part of the PureEdge Solutions acquisition in mid-2005, where he held the position of Solutions Engineering Manager. Prior to joining PureEdge, Cayce worked as a consultant and software architect in the telecom and financial services industries. His areas of expertise include Workplace Forms, XForms, systems integration, and SOA. Cayce has authored a range of forms-related publications including the whitepaper "Extending SOA with XForms" and the IBM Redbooks publicaiton *IBM Workplace Forms: Guide to Building and Integrating a Sample Workplace Forms Application*, and he recently co-authored the second edition of *Programming Portlets*.

Andreas A. Richter is a system architect working in IBM Software Service for Lotus (ISSL) since 1999, specifically for the IOT Europe North East division. He primarily leads Domino-based application development projects, Lotus Workfow projects, and integration projects with SAP® HR data in large accounts. Beginning in 2004, he started to focus on J2EE™ application development (IBM Workplace, Workplace Managed Client™, Workplace designer, Bowstreet Portlet Factory). Since November 2005, he has been concentrating on IBM Workplace Forms while continuing to also engage in Domino projects.

George Poirier is member of the World Wide Technical Sales team for Workplace Forms and Workplace Learning. He has been with IBM for 30 years. As an employee of IBM, his roles have included seven years in Worldwide Technical Sales, a Systems Architect for the Lotus Professional Services (ISSL), and an MVS™ Technical Support Specialist in IBM Dallas System Center. George has developed and delivered several Learning deepdive enablement sessions.

Manny Santana is a Technical Specialist with IBM Australia's Software Group Services, and is based in Sydney. He currently performs consultancy and technical work for major clients in A/NZ, and has over 10 years of experience in development, deployment, and support of various internal IBM applications in the GWA and GNA environments. He received a Bachelor of Science degree from the University of Sydney, and is an IBM Certified Advanced Application Developer - Lotus Notes® and Domino 7. Manny co-authored the Lotus Domino 7 Application Development Redpaper.

Edward Dussourd is a member of the Eastern Regional SWAT team in the United States. He has worked for IBM for more than eight years in various roles as a Technical Specialist, providing software, services, education, and consulting solutions to business partners and customers. For the majority of his career he has specialized in e-learning offerings from IBM. Late in 2005, Ed transitioned to the IBM Workplace Forms solution offerings as a Senior Technical Specialist.

Thanks to the following people for their contributions to this project:

Paul A. Chan, Worldwide Director, Forms Marketing, IBM Software Group, Lotus, IBM, Victoria, BC Canada

Bob Levy, Workplace Product Management, IBM Software Group, Lotus, IBM, Cambridge, MA

Steve Shewchuk, Workplace Forms Enablement, IBM Software Group, Lotus, IBM, Victoria, BC Canada

Eric Dunn, Workplace Forms Enablement, IBM Software Group, Lotus, IBM, Victoria, BC Canada

Become a published author

Join us for a two- to six-week residency program! Help write an IBM Redbooks publication dealing with specific products or solutions, while getting hands-on experience with leading-edge technologies. You'll have the opportunity to team with IBM technical professionals, Business Partners, and Clients.

Your efforts will help increase product acceptance and customer satisfaction. As a bonus, you'll develop a network of contacts in IBM development labs, and increase your productivity and marketability.

Find out more about the residency program, browse the residency index, and apply online at:

ibm.com/redbooks/residencies.html

Comments welcome

Your comments are important to us!

We want our Redbooks to be as helpful as possible. Send us your comments about this or other Redbooks in one of the following ways:

- Use the online **Contact us** review form found at:

  ibm.com/redbooks

- Send your comments in an e-mail to:

  `redbooks@us.ibm.com`

- Mail your comments to:

  IBM Corporation, International Technical Support Organization
  Dept. HYTD Mail Station P099
  2455 South Road
  Poughkeepsie, NY 12601-5400

1

Introduction to IBM Workplace Forms

IBM Workplace Forms *unlocks* the enterprise value of information currently trapped within paper forms by dramatically improving the access to accurate and timely information by people and systems.

IBM Workplace Forms enables organizations to streamline core processes and compliance-oriented operations, resulting in reduced costs and improved service levels to customers, suppliers, partners, and employees.

By incorporating IBM Workplace Forms into your organization, and converting from paper-based forms to electronic forms, IBM Workplace Forms provides a security-rich, dynamic, and intelligent front-end to your organization's business processes.

The IBM Workplace Forms product family consists of a server, designer, and client viewer that together enable the creation, deployment, and streamlining of XML Forms-based processes. By leveraging open standards to integrate an intelligent user interface with high-value back-end systems, IBM Workplace Forms provides public and private sector organizations across many industries with security-rich forms that leverage existing resources and systems to help better serve customers and increase operational efficiency.

This book describes the features and functionality of Workplace Forms and each of its component products. After introducing the products and providing an overview of features and functionality, the underlying product architecture and integration techniques are described. To help potential users, architects, and developers better understand how to develop and implement a forms application, a specific business scenario based on a *sales quotation approval* application is implemented.

Using this base scenario as a foundation, the process of building an application that captures data in a form, then the application of specific business logic and workflow to gain approval for the product sales quotation is described in detail. Throughout the scenario, we build upon the complexity of the application and introduce increasing integration points with other data systems. Ultimately, an IBM Workplace Forms application that integrates with WebSphere Portal, IBM DB2 Content Manager, and Lotus Domino is described.

Note: While the examples in this book use IBM products, the integration examples and approaches can be applied to a wide variety of databases, content management, document management, portal, and workflow systems due to the implementation of open standards architecture of Workplace Forms.

Which specific version of IBM Workplace Forms does this book apply to?

This book has been written with the intent of showing IBM Workplace Forms Release 2.6.1.

- The concepts and value proposition in this introduction chapter apply to both Release 2.5 and Release 2.6.1. Release of 2.6 of Workplace Forms provides full support for the XForms standard.
- All specific features and functions reviewed in Chapter 2, “Features and functionality” on page 19, refer specifically to Release 2.6.
- All specific examples shown and used when building the sample scenario application are based on the codebase for IBM Workplace Forms Release 2.6.1.

1.1 What is a form

As a foundation to discuss the benefits and specific features and technology of IBM Workplace Forms, it is important to first establish a common understanding of the term *form*.

For the context of this product, the following is the definition of a *form*: a blank document or *template* to be filled in by the user. The form serves a structured mechanism to capture data. A form frequently initiates a transaction or business process and often becomes the record of the transaction being stored in a system of record.

In the most traditional sense, forms have been largely paper based. In this book, the benefits of electronic forms and the ability to process and reuse the data captured in forms is examined. We demonstrate how an XForms-enabled eForm is more than just a form. It is a dynamic user interface that captures structured data at the front-end of the business process and enables a rich user experience.

1.1.1 Form as a front-end to a business process

Given the information-intensive nature of business, both documents and forms are essential components in driving and supporting all types of processes. These include processes and procedures, regulatory requirements and compliance issues, and inter-agency/inter-departmental and constituent/customer communications. Document types range from spreadsheets to engineering drawings to Web information. They can come from desktop users or output from back-end systems such as ERP, CRM, content management, and legacy systems.

Why are documents so critical?

- They are a necessary and ubiquitous part of business. In many cases, they are the *end product* of a service (a business permit or an insurance policy, for example).
- Documents are familiar, readily available in paper or online forms, and deliver high levels of visual quality.
- Documents meet regulatory or compliance requirements that often dictate a document's precise look and feel (insurance policies, tax forms, permits, and so on).
- Documents are universally accepted: they can be used offline.

Forms are also a critical part of business processes and procedural transactions.

Filling out forms (from business permits to filing taxes) is familiar to anyone who has dealt with government agencies. Forms are used to capture information from individuals and organizations. Much of this information ends up in core IT systems.

While the form is a structured mechanism to capture data, much of the business value lies in how the data is processed once it has been entered. The form acts as a UI for entering the data, and is commonly a starting point for a business process.

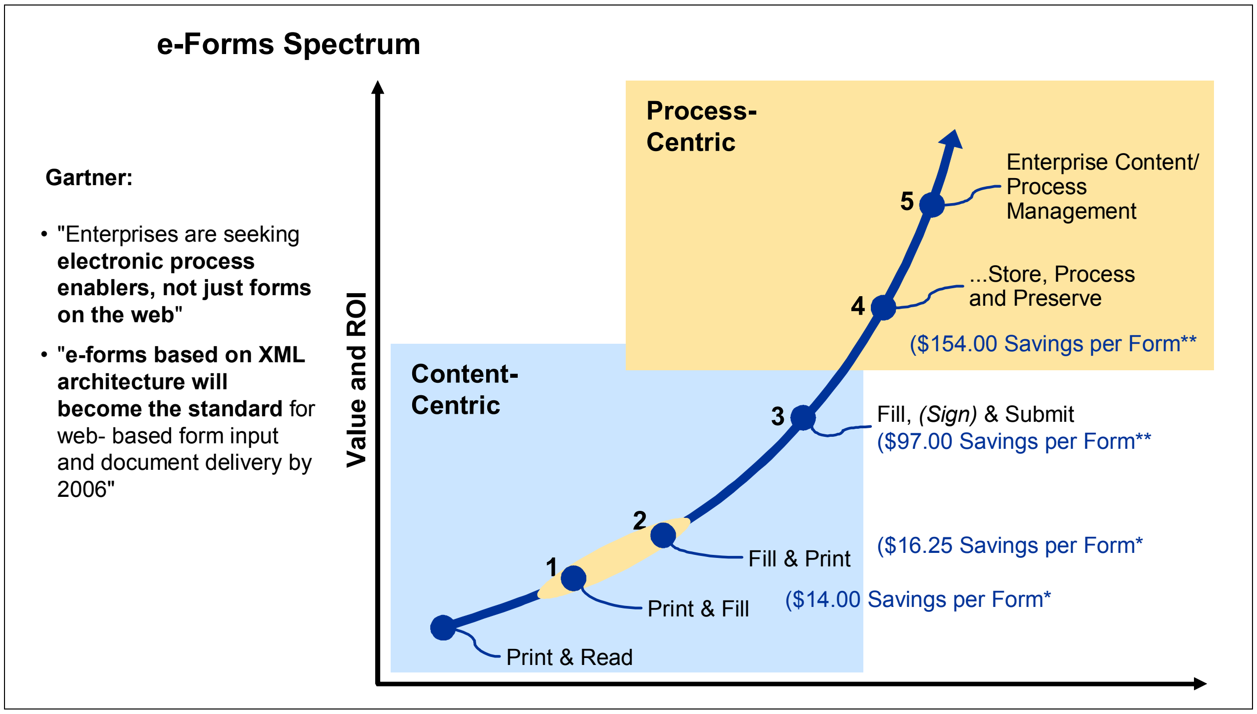
For example, one of your customers might fill out a paper form to open a new account. Once that form is completed and passed to the correct department, the process of creating that account begins. This concept is fundamental to understanding and appreciating the business value of electronic forms. A form is a front-end to a process. Ultimately, IBM Workplace Forms provides a solution that goes beyond merely converting paper-based forms to electronic forms. The real value is the ability to *integrate* people, information, and processes.

Key concept: A form is a mechanism for capturing data and represents a front-end to a *business process*.

1.1.2 Electronic forms: XML intelligent documents

When considering the benefits that result from evolving toward electronic forms and XML intelligent documents, there are several levels of integration to be considered. The extent to which electronic forms (eForms) have been fully integrated into an organization's business processes impacts the level of value and *return on investment* (ROI) from the implementation of electronic form processing.

As shown in Figure 1-1, you can look at eForms from a content-centric view or a process-centric view. The entry point or level 1 is the Print and Fill form. For example, you might download a form from the Web, print it, fill it out, and then mail or fax it in for processing. There is *some* value with this (namely, the company provided the user or customer with the form from a Web site versus having to mail them a copy), but this is just the prelude to what is possible. At this level, the back-end processing of the form has not changed. Only the delivery method has been improved.



e-Forms Spectrum
Gartner:
• "Enterprises are seeking electronic process enablers, not just forms on the web"
• "e-forms based on XML architecture will become the standard for web- based form input and document delivery by 2006"
Value and ROI
Process-Centric
Content-Centric
5
Enterprise Content/ Process Management
4
...Store, Process and Preserve
($154.00 Savings per Form**
3
Fill, (Sign) & Submit
($97.00 Savings per Form**
2
Fill & Print
($16.25 Savings per Form*
1
Print & Fill
($14.00 Savings per Form*
Print & Read

Figure 1-1 Spectrum of eForm integration

As you go up the value curve, you will start to realize a larger return on your investment, and it can grow exponentially when you start to cross into the process spectrum. For example, level 3 represents an environment in which you allow the user or customer to fill out an electronic form, optionally sign it, and submit it for back-end processing. Tremendous investments are being made to put paper processing online, and use automation to do more of the work. A Fill and Submit type of an eForm (level 3) is an excellent example of this capability.

The other levels of eForms processing (level 4 and level 5) are extensions to the fill and submit example, where you are truly adding an electronic workflow to the form once it has been submitted. Approvals for anything from purchase orders to human resources greatly enhance the Forms application. Finally, at level 5, you make the content (the form) part of an Enterprise Content Management (ECM) environment. In this case, you allow for re-use of the form or content in other applications or part of a larger overall storage strategy. An example of this might be a customer folder concept, where the eForm is one piece of content in the overall electronic customer folder. The form at this stage becomes legal documents of record and represent the entire transaction process.

Finally, the value of implementing electronic forms can be viewed in the following terms:

- Meeting customer and partner demands
  - Faster, easier access to online forms and services
  - Consistent experience across programs and delivery channels
- Increasing operational efficiencies
  - Automated paper processes
  - Integrated services delivery
  - Hard dollar savings with accelerated ROI
- Ensuring security
  - Protecting customer/partner privacy
  - Controlling access
  - Ensuring content integrity
  - Authenticating people and processes

The degree to which your organization can leverage these benefits depends upon where you are in the spectrum of integrating eForms.

1.1.3 Forms marketplace

According to industry analysts, eForms represent a $500M market, with the following notable points:

- XML-enabled eForms will double in use as a standard enterprise document format.
- By 2009, 25% of enterprises will use XML-based document processes.
- From IDC and Gartner - Forms comprise 80–85% of business processes, which makes it the most pervasive document enabling business organizations to automate processes.
- An XML-enabled eForm is more than just a form. It is a dynamic user interface that captures structured data at the front-end of the business process, and enables a rich user experience:
  - It enforces business rules and validates data at the glass.
  - It is a computation engine without server refresh.
  - It provides a secure transaction captured in a standard data model with digital signatures.
  - It functions offline and online — thin or rich client.
  - It is a storable and retrievable document object that can traverse a business process.

Figure 1-2 illustrates the positioning of IBM Workplace Forms relative to other forms implementations. In terms of both enterprise value and functionality, Workplace Forms ranks the highest due to its advanced functionality, ability to integrate with and drive business processes, and its ability to meet regulatory compliance requirements. Alternatively, competitors such as Microsoft® and Adobe® provide *proprietary forms solutions* at the bottom of the middle tier.

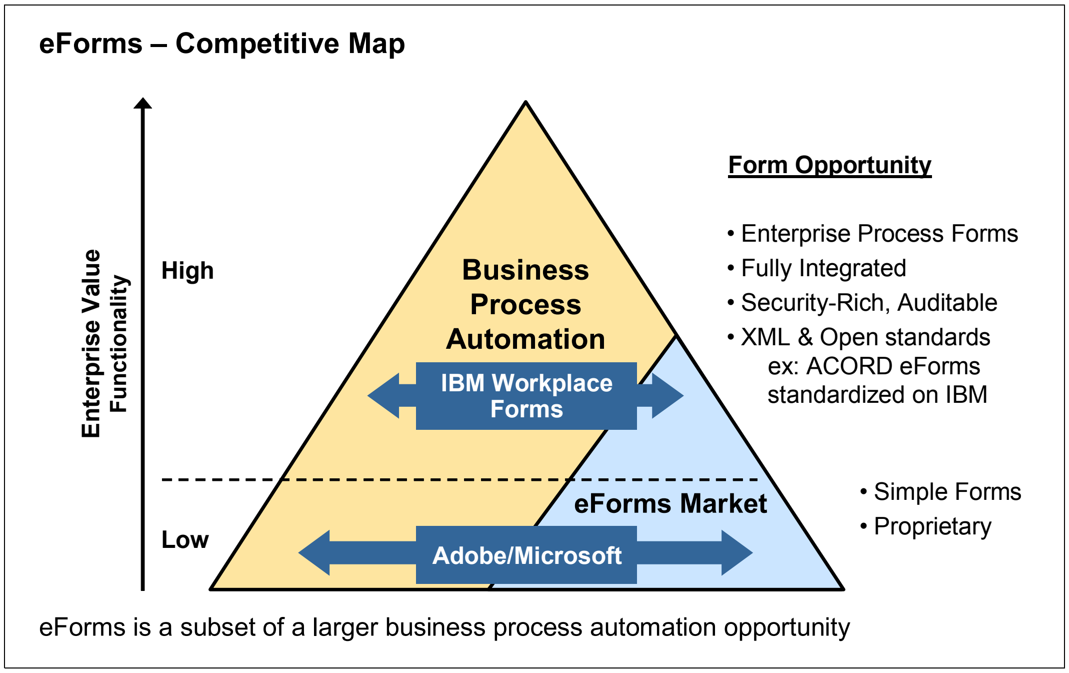

eForms – Competitive Map
Enterprise Value Functionality
High
Low
Business Process Automation
IBM Workplace Forms
eForms Market
Adobe/Microsoft
Form Opportunity
• Enterprise Process Forms
• Fully Integrated
• Security-Rich, Auditable
• XML & Open standards ex: ACORD eForms standardized on IBM
• Simple Forms
• Proprietary
eForms is a subset of a larger business process automation opportunity

Figure 1-2 Positioning of IBM Workplace Forms

1.2 Overview of IBM Workplace Forms

The IBM Workplace Forms suite includes the following products:

- IBM Workplace Forms Viewer
- IBM Workplace Forms Designer
- IBM Workplace Forms Server

Together, these tools allow you to create, fill, and submit forms, and integrate those forms with your back-end processes. Ultimately, IBM Workplace Forms tools work together to make each of the functions possible (creation, submission, and integration with other data systems) and can be used to create an end-to-end solution.

Figure 1-3 illustrates a conceptual overview of how the products work together within the context of a complete Web-based forms application.

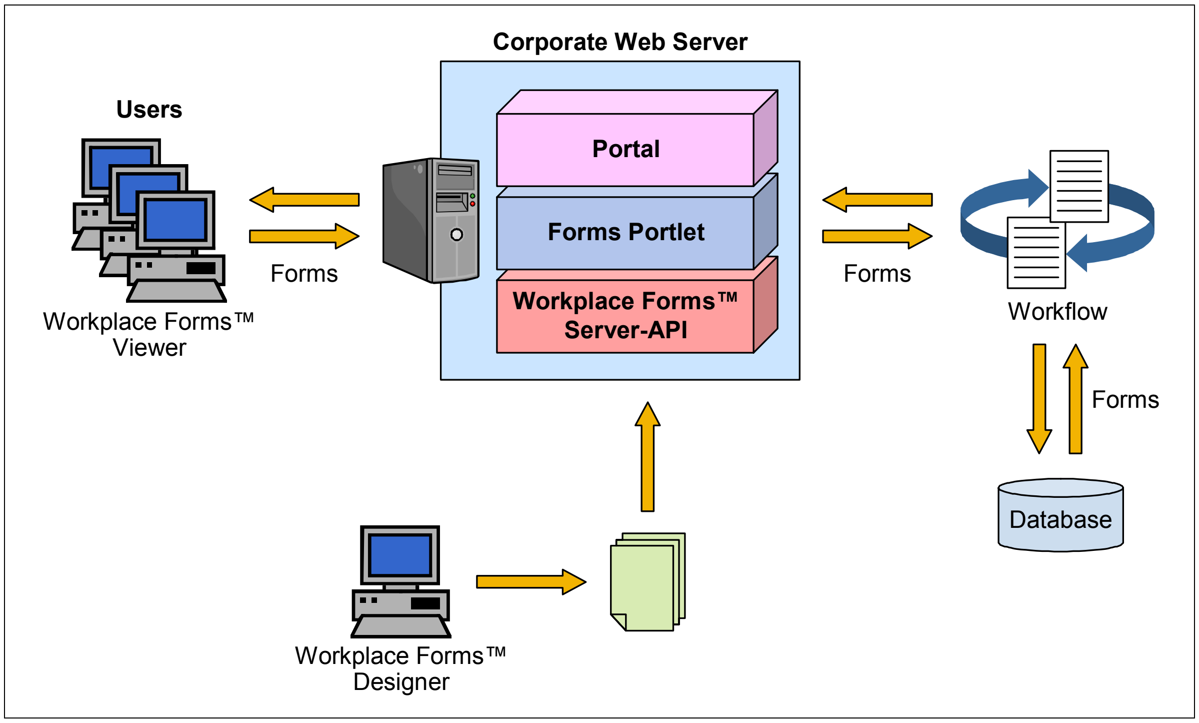


Figure 1-3 Conceptual overview of Workplace Forms

Figure 1-4 on page 8 illustrates a more in-depth view of how IBM Workplace Forms works with other products in the IBM Software portfolio.

- *IBM Workplace Forms Viewer* is a feature-rich desktop application used to view, fill, sign, submit, and route eForms, and is able to function on the desktop or within a browser. It enables full connectivity with real-time integration using many integration techniques. The open standards framework of IBM Workplace Forms enables Workplace Forms Viewer to operate in portal or stand-alone environments, in online or offline modes, and as a plug-in for thin or rich-client browsers.
- *IBM Workplace Forms Designer* is an easy-to-use WYSIWYG eForm design environment that supports the drag-and-drop creation of precision forms with an open and accessible XML-schema-derived data model. IBM Workplace Forms Designer leverages open standards to deliver advanced forms-based business process automation solutions that integrate seamlessly across lines of business applications and IT infrastructure.
- *IBM Workplace Forms Server* suite enables the creation and delivery of XML Forms applications. It provides a common, open interface to enable integration of eForms data with server-side applications using industry-standard XML schemas. IBM Workplace Forms Webform Server delivers a true Zero Footprint solution by providing eForms to external users quickly and efficiently within a browser without requiring additional downloads or plug-ins. IBM Workplace Forms Webform Server provides a low administration solution for data-capture requirements while supporting precise viewing and printing, automated validation, and the security and compliance capabilities of XML eForms.

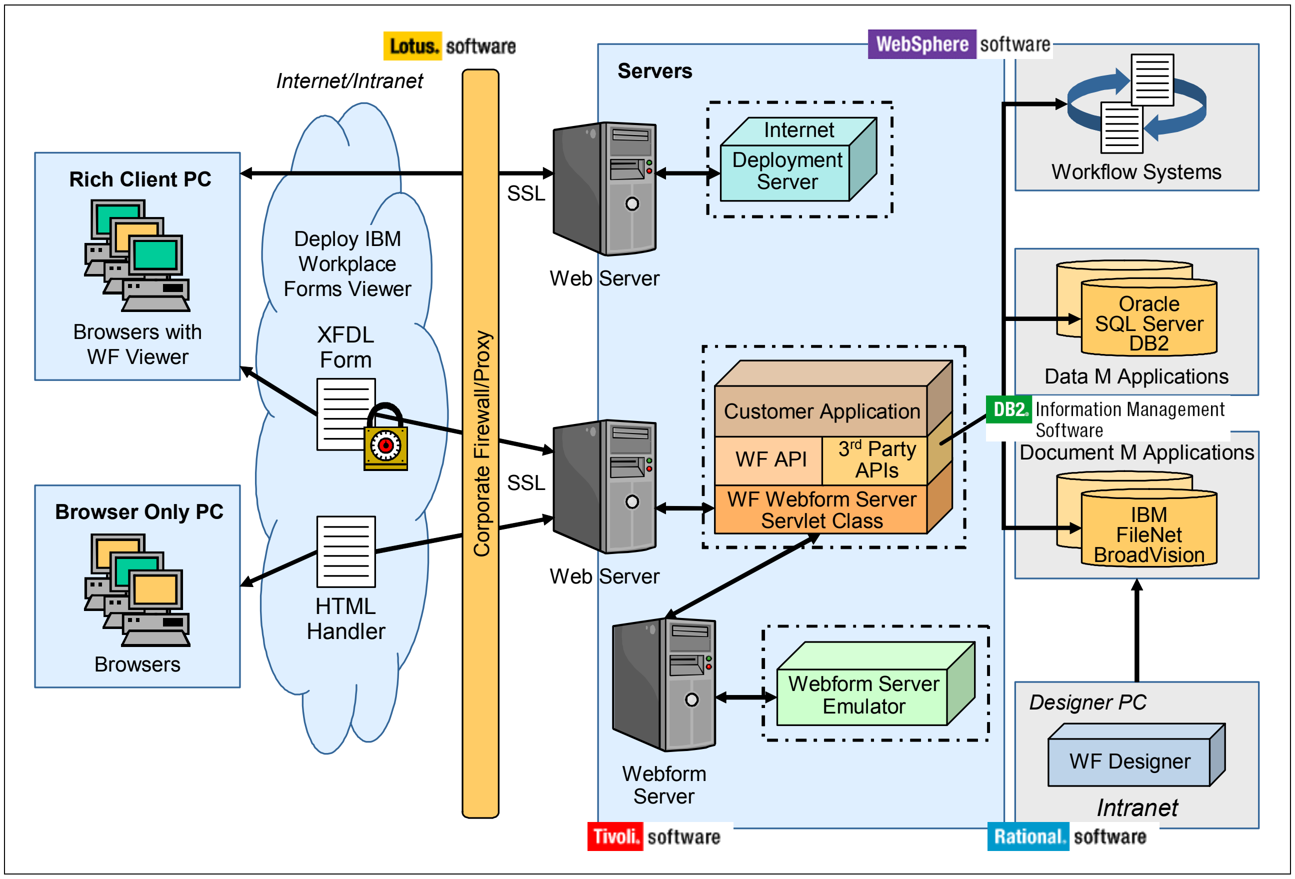


Figure 1-4 Architecture of Workplace Forms

1.2.1 Value proposition

In this section we highlight key value points where IBM Workplace Forms can benefit your organization.

IBM Workplace Forms allows your organization to more efficiently and effectively integrate people, information, and processes.

Starting with the traditional paper-based forms:

- Workplace Forms *unlocks the value* trapped in paper forms.
- Workplace Forms then makes this information *more accessible.*
- Workplace Forms helps *manage* the information and associated processes *more efficiently.*

IBM Workplace Forms enables you to *extract value* from paper-based data. This ensures:

- Accurate information: data you can rely on

  Data and schema validation provided at the client and server levels using business logic that understands business process, data types, and schema requirements.

  Business impact: ensures accurate data required by all systems that touch the data or are involved in the business process. No expensive downstream re-work. Ensures that business can process data efficiently.

- Timeliness of data: enabling the right data at the right time

  On demand data capture from employees, customers, suppliers, and partners. Captures information as required by real-time processes, and uses business rules and Web services to get the *right data at the right time*.

  Business impact: the right data at the right time. This enables straight-through processing by capturing all necessary data as required to optimize a business process.

- Enhanced user productivity: role-based personalization

  Business logic is used to create personalized role-based *wizards* that can work online or offline to dramatically decrease the time required for each participant in a forms-based process.

  Business impact: Users have a personalized form-filling experience to minimize data capture tasks and maximize productivity.

- Leading forms technology: next generation online forms

  Best in class technology standards support include Web 2.0 (Ajax) for powerful browser-based forms experience: XForms — the only W3C approved standard for the next generation of Internet forms. XML, XML Schema, and Web services are all supported since Workplace Forms was designed from the ground up to support online forms.

  Business impact: best forms technology on the market built on common open standards.

- Enterprise accessibility of data: leveraging information across the enterprise

  Interoperable forms based on Open Standards (XML, XML Schema, XForms). Forms operate across various workflow, repository, portal, collaboration, and document management systems. Thin server architecture that supports J2EE and .NET implementations ensures high performance and throughput that can be easily scaled and grow with the customer's needs. The largest forms customers in the world use Workplace Forms.

  Business impact: Forms that work across system, division, and corporate boundaries provide business flexibility to enable and extend forms-based processes to create an On Demand business.

- Flexible and rapid deployment: rich or thin client options

  Rich client, thin (browser), or hybrid solutions provide flexibility of deployment for customers that require offline, online, and varying process or deployment requirements. *Design once render many* paradigm. Fast deployment using robust migration tools (from static formats such as PDF) and an Eclipse design tool that can create reusable form components.

  Business impact: flexibility to deploy for any process that spans organizations and diverse customer process requirements. Rapid time-to-value. Proven references.

- Managing information and processes more efficiently: lower operating costs

  Workplace Forms supports role-based workflows with flexible support for document and data driven workflows and support for complex process flows that can involve multiple and overlapping authorizations and signatures.

  Business impact: Workplace Forms enables straight-through processing and optimization of forms-based processes to reduce costs and decrease process cycle times.

- Best of breed compliance document: a robust transactional record

  A Workplace Form acts as a document throughout the life cycle of a process — from initiation to archiving a record of the transaction. Based on declarative business rules that avoid document integrity issues associated with scripting languages where digital signatures are used.

Business impact: no separate paper or imaged copies required to document a transaction or compliance of a process.

- Transactional document for Service Oriented Architecture (SOA): the business process document for SOA
  - Workplace Forms uses a *thin architecture* that ensures high performance while adding an intelligent document that adds business process rules. Leverage Web service support in the Workplace Forms client and add the process rules that add unique knowledge to XML schemas to drive process automation.

    Business impact: a process-aware document that instantiates and drives process improvement.
  - Workplace Forms enable the customer to implement process automation in a straight-forward and effective way. By exploiting the key technology in Workplace Forms, you are placed on an on ramp to SOA.

    Business Impact: This enables effective innovation that improves ROI and the implementation of SOA.

1.2.2 Product positioning

IBM Workplace Forms builds upon the value of the IBM Software portfolio. Advanced eForms are a critical component of industry solutions due to their broad applicability to a variety of business processes. IBM Workplace Forms serves as a *common front end* to many different products within the IBM Software Portfolio (Figure 1-5).

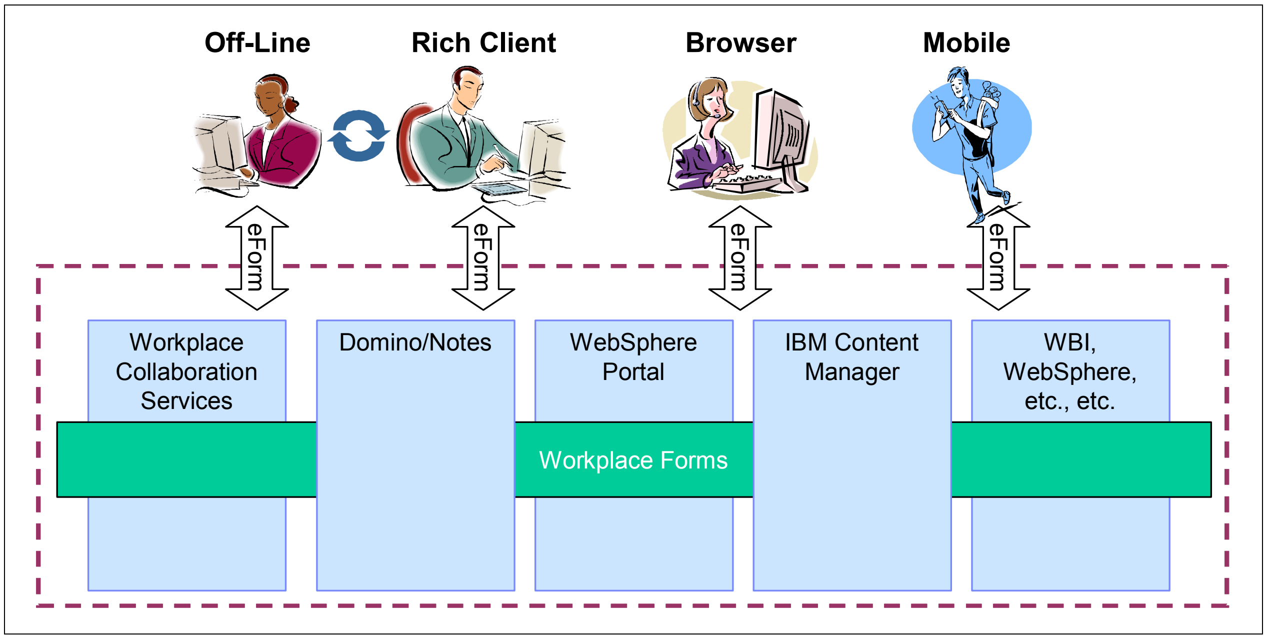


Figure 1-5 How Workplace Forms builds upon existing IBM Software products

Workplace Forms:

- Provides a market-leading business process automation framework composed of products, partnerships, and services to create, manage, and deploy XML Forms-based processes.

  This addresses customer demand for increased efficiencies in business process management.

- Helps to further drive Open Standards, especially XForms, a key open industry standard that IBM supports. Workplace Forms also supports Java™, XML, and Eclipse technology.

  This accelerates adoption of open industry standards (such as XML and XForms) to ensure that business information is not locked in a proprietary format.
- Delivers high-value industry solutions. This fulfills customer demand for industry-specific applications to replace manual forms.
- Leverages complementary technology. Workplace Forms is a logical extension to the extensive forms-based application development business in Lotus Notes. Additionally, it complements Lotus Domino and IBM Workplace solutions for risk and compliance management.

1.3 Innovation based on standards: XForms and XFDL

Workplace Forms is built upon proven, standards-based technology, including XForms and Extensible Forms Description Language (XFDL). As Web-based electronic forms have become more ubiquitous, XForms has emerged as the W3C specification for Web forms to overcome limitations with HTML Forms.

The design goals of XForms meet the shortcomings of HTML forms point for point:

- Excellent XML integration (including XML Schema).
- Provide commonly requested features in a declarative way, including calculation and validation.
- Device independent, yet still useful on desktop browsers.
- Strong separation of purpose from presentation.
- Universal accessibility.

XForms enables eForms that can be used with a wide variety of platforms, including desktop computers, handhelds, information appliances, and even paper. For example, as displayed in Figure 1-6, we might use rich, XFDL-based forms on our laptop, however, WML may prove more suitable for a PDA or mobile phone. XForms controls are intended to abstract data access sufficiently to allow *skinning* of views with a variety of host languages.

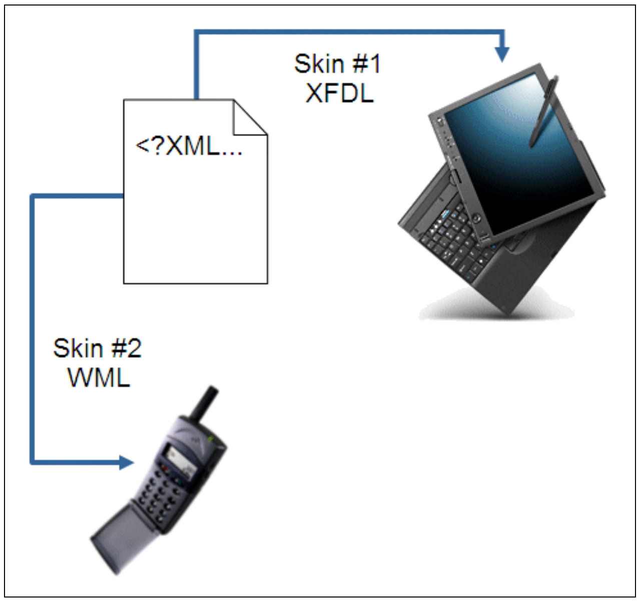


Figure 1-6 Conceptual diagram showing XForms Model skinned by different host languages

Important: W3C XForms is an open standard for forms on the Web that builds on the syntax of XML data schemas. It provides the necessary rules and user interface abstraction to enable a forms data processing model that ensures interoperability for customers and partners, and that speeds time-to-market and reduces costs.

XForms: business benefits and customer value

The W3C XForms standard provides the following major benefits to customers:

- Standardization at a technology and industry transaction level enables interoperable B2B processes.
- Standardization of a forms data processing model enables reusable components that integrate with SOA, enabling faster time-to-market with lower form application deployment and maintenance costs.

This standardization is accomplished in the following ways:

- XForms supports existing industry schemas.
- XForms can extend industry data schemas to support forms processing rule.
- XForms provides standards organizations with a more complete form definition to enable industry participants with a faster time-to-market and a greater level of interoperability.

Ultimately, this results in the following business benefits:

- Enables application interoperability: XForms are available on any device, in any language, for any able or impaired person, and in any role within a business process.
- Enables industry transactional standards: XForms supports industry schemas along with transactional rules/UI.

- Lowers application development costs: XForms enables reusable form components with multiple client deployment options.
- Enhances and complements SOA: XForms provides a forms data processing model and supports active content using declarative rules and Web services.

1.3.1 W3C XForms and IBM Workplace Forms

Extensible Forms Description Language (XFDL), developed by UWI.Com and Tim Bray, is an application of XML that allows organizations to move their paper-based forms systems to the Internet while maintaining the necessary attributes of paper-based transaction records. XFDL is designed for implementation in business-to-business electronic commerce and intra-organizational information transactions.[1]

XFDL is a highly structured XML protocol designed specifically to solve the problems associated with digitally representing paper forms on the Internet. The features of the language include support for a high-precision interface, fine-grained computations and integrated input validation, multiple overlapping digital signatures, and legally binding transaction records.

What XFDL adds to XForms

The benefits include:

- Document-centricity.
- XFDL stores the data in the document, creating a single record.
- Precision layout and printing.
- Can faithfully reproduce paper forms.
- Wizard-based, dynamic forms.
- Can guide the user through filling process, change on the fly, and reduce errors.
- Broad support for signatures.
- Locks both the XFDL presentation and the XForms data.
- Extension points for integration with other technologies.
- Can embed .jar files in the form to extend the functionality.

What XForms add to XFDL

The benefits include:

- New items
- Table, pane, checkgroup/radiogroup, slider
- XForms event handlers
- Value-changed, read-only, read/write, submit-error, and so on
- XForms functions
- Boolean-from-string, avg, min, max
- Device independence

Common XML Data Model

Workplace Forms gives a common XML Data Model (based on the W3C XForms standard) that can work in heterogeneous IT environments. These are common in most organizations that can combine diverse J2EE, .NET, legacy, CRM, ERP, HRMS, Content, Document, and Workflow environments. Also, this common XForms Model within Workplace Forms provides the ultimate flexibility in providing personalized, role-based *views* of this data for improved user productivity (wizard is an example of this). This common XForms Model also allows for

[1] *XFDL: Creating Electronic Commerce Transaction Records Using XML*: Barclay T. Blair and John Boyer http://www8.org/w8-papers/4d-electronic/xfdl/xfdl.html

multiple system *views* or schemas necessary for straight through processing of this same data as required for back-end integration.

1.3.2 XForms + XFDL in alignment with SOA

In addition to standardizing an eForm document model, XForms technology has excellent alignment with both the principles and technical requisites of service-oriented architectures (SOA). XFDL + XForms provides Workplace forms with an enabler for service oriented eForm solutions, while strong technical alignment also reduces barriers.

At a functional level, one often sees a similar set of activities occur throughout different forms applications and forms-based processes. Let us consider some of the most common interactions that take place in Web and portal eForm applications. Standard interactions in eForm applications include:

- Server-side form prepopulation, that is, the merging of an empty form template with data.Submission of a form into a Content Management (CM) system at various stages of a process or workflow
- Submission of a completed, signed form to a Record Management System as a transaction record at the conclusion of a process
- Presentation of a form to users on laptops (mobile computers), tablet, or handheld devices both in online and offline modes
- Storage of form data into a database (often for reporting or for use by other systems)
- Transmission of form data into one or more Line-of- Business (LOB) systems
- Validation of digital signatures as part of an approval process

Figure 1-7 provides a representative example of how eForm application functionality can be effectively used within the business tier of a larger Web application.

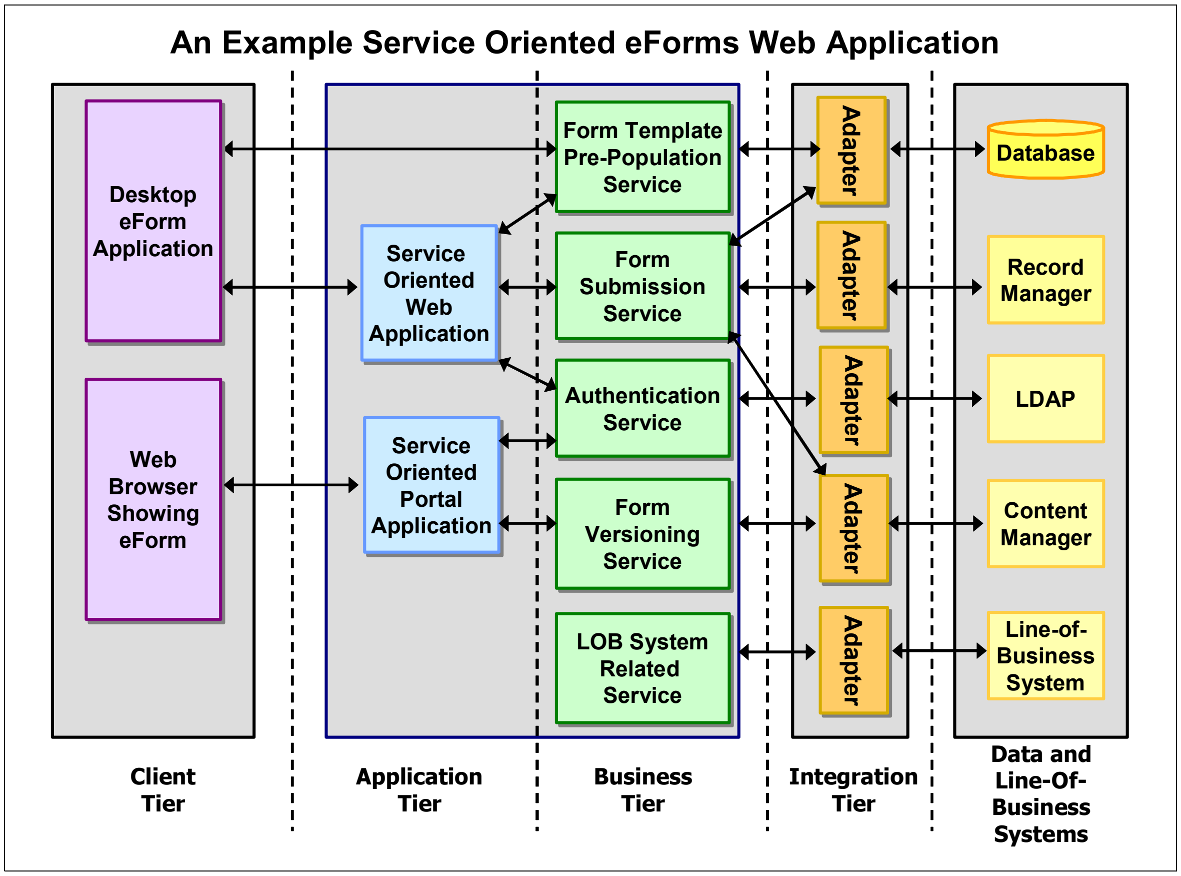

An Example Service Oriented eForms Web Application
Desktop eForm Application
Web Browser Showing eForm
Service Oriented Web Application
Service Oriented Portal Application
Form Template Pre-Population Service
Form Submission Service
Authentication Service
Form Versioning Service
LOB System Related Service
Adapter
Adapter
Adapter
Adapter
Adapter
Database
Record Manager
LDAP
Content Manager
Line-of-Business System
Client Tier
Application Tier
Business Tier
Integration Tier
Data and Line-Of-Business Systems

Figure 1-7 Example service-oriented eForms Web application

As you can see, a number of the services within the business tier are encapsulations of specific form application-related functionality, designed for reuse across multiple applications.

1.3.3 Sample solutions

The flexibility of the IBM Workplace Forms tools allow you to create solutions for any form-based process. The example scenario used for building the sample application in this book is intentionally kept generic, illustrating aspects of a Workplace Forms application that apply to businesses across many industries, as well as illustrating concepts and benefits that apply to both small or larger organizations.

The following summaries discuss possible industry-specific solutions that you can create using these tools.

Government program registration

Government agencies often need to enroll the general public in a variety of programs. In these cases, the government tries to serve a large and diverse population with various levels of computer knowledge and Internet connectivity. The Webform Server component of the Workplace Forms suite offers the perfect solution for these situations. Users can log onto a central Web site and complete a registration form using only their Web browser. This saves them from having to download and install Workplace Forms Viewer, which can be intimidating for some users and time consuming over low bandwidths.

Additionally, while it is not possible to issue a digital certificate to each citizen, you can use Clickwrap signatures to capture some information about the user and confirm approval. Clickwrap signatures simulate the *click to accept* process that is common on many Web sites today, and add a measure of security to the form. They can also can include information about the user, such as a pass phrase, that you can use later to identify them.

1.3.4 Banking and regulated industries

Banking and other regulated industries must comply with a variety of government regulations, and must be able to produce reliable audit trails to demonstrate their compliance. In these cases, records must be maintained for many years, and those records must be secure.

Workplace Forms supports a wide range of digital signature technologies ranging from simple authenticated password acceptance to biometric (retinal scans, fingerprint readers) and PKI certificates. Once a form is signed, the signature makes the form tamper evident. This means that if any of the information in the form is changed, the signature itself breaks, indicating that it can no longer be trusted. Furthermore, Workplace Forms provides the ability to sign a form template that indicates whether anyone has tampered with the template itself. Finally, most digital signature technologies reliably identify the signer. These features combine to create reliable records: you can identify who signed each form, and you can easily judge whether the form has been changed in any way.

Additionally, the forms themselves are written to comply with open standards promoting interoperability and reducing the total cost of ownership through support of standards such as XML, XForms, JSR-168/170, and so on. Workplace Forms also uses a native XML document type that future proofs archival records of forms so that organizations can feel confident that forms records and the data contained within can be recovered within the necessary retention and record keeping requirements.

Secured communications

Some organizations may require more than just signatures to secure their forms. This is sometimes the case due to privacy laws or other legal requirements that insist that the forms themselves cannot be viewed by other people. In these cases, signature technology falls short, because while it will reveal tampering with a form, it does not prevent simple viewing.

Using the Workplace Server API, you can create an extension for Workplace Forms Viewer that will encrypt each form before it is sent. The server that processes the forms can then use the API to decrypt the form once it is safely behind a firewall.

The form is encrypted before it leaves the user's computer. If it is intercepted during transmission, or copied from a public server, it is completely unreadable. However, once it is safely behind a firewall, it can be decrypted and processed with ease.

This encryption capability allows organizations the flexibility to provides differing levels of encryption as appropriate to the application or individual form and allows this to be updated as new encryption standards come into the market.

1.3.5 Proven eForm technology

While the name of this product includes IBM Workplace (intended to reinforce the integration with other Workplace products in the IBM Software portfolio), IBM Workplace Forms is based on proven technology from PureEdge solutions, acquired by IBM in 2005. The product has evolved over more than a decade of improvements, based on input from several hundred customers. Beginning with a solid foundation of eForm technology from PureEdge Solutions — a leading provider of secure standards-based eForm solutions for automating business processes — coupled with IBM experience and customer base, Workplace Forms products provide a valuable addition to the IBM software portfolio and enhances IBM market leadership in providing industry-specific eForms solutions.

Key industries where Workplace Forms have been implemented include government, insurance, banking, manufacturing, and health care.

One of the most compelling customer examples is the U.S. Army, which selected Workplace Forms over the competition for what Gartner Group calls *the largest eForms implementation* in the world. The Army's Forms Management Content Program (FCMP) involves the automation of their inventory of 100,000 forms used by 1.4 million personnel worldwide. Estimated cost savings of this forms implementation surpasses $1.3M annually. The Army forms program integrates Workplace Forms with CM in a portal environment.

The primary reasons that the Army chose Workplace Forms over the competition included: sectional signing within a form, ability to generate a wizard-like interface, and offline use.

The Land and Property Programs, Corporate Registries of Service Nova Scotia records and manages all of Nova Scotia's land ownership and interest records and provides online access to them from anywhere in the world. The Workplace Forms solution that they implemented reduces transaction time for most locations from up to seven days to just one business day. It also improves rejection rate from 15% to 3% by reducing errors associated with the submitters' manual data entry. This process minimizes trips to the agency's offices and reliance on expensive courier services.

A government council in the United Kingdom expects to save £300,000 per year using IBM Workplace Forms software to consolidate information from multiple disparate data sources.

The Workplace Forms application enables their social care practitioners to share data within the county's various agencies in a structured, standardized format. When patient data is gathered by one agency, the Workplace Forms software enables the agency to share that information with key business applications within the county, enabling access by multiple practitioners and external agencies. The solution also enables Oxfordshire County Council to keep a record of the data distribution process, in compliance with county regulatory requirements.

1.4 Summary

This book provides both an overview of the features and functionality of IBM Workplace Forms, while also providing a specific sample application scenario. After clarifying the features of the product and defining the options for integration, the remainder of the book, beginning with Chapter 5, "Building the base scenario: stage 1" on page 173, helps you gain hands-on experience building a sample Forms-based application. Using this sample application as a foundation, we then discuss integration options with WebSphere Portal, IBM DB2 Content Manager, and Domino.

2

Features and functionality

This chapter provides an overview of the features and functionality of the components that make up IBM Workplace Forms. The chapter begins with an introduction to the Workplace Forms document model and an overview of the Workplace Forms component technology. Working from this foundation, it then discusses functionality of the components, including:

- Forms document model
- Installing the software
- Introduction to the Designer
- Form Design basics
- Add a toolbar
- Add computes
- Signature buttons
- Workplace Forms Viewer

2.1 Forms document model

Workplace Forms is built upon proven, standards-based technology, including Extensible Forms Description Language (XFDL) and XForms. XFDL is a highly structured XML protocol designed specifically to solve the body of problems associated with digitally representing paper forms. XForms is not only about data collection, it is also about improving the user experience and making form design quicker and system integration easier.

In this section we explore the following topics:

- Extensible Forms Description Language (XFDL)
- Workplace Forms component technology
- XForms Model

2.1.1 Extensible Forms Description Language (XFDL)

In this section we cover the following topics:

- Overview
- Capabilities
- XFDL features
- XFDL advantages

Overview

From 1993 to 1998, PureEdge Solutions (since acquired by IBM) developed the Universal Forms Description Language (UFDL). Extensible Forms Description Language (XFDL) is the result of developing an XML syntax for UFDL, which is used to describe complex, intelligent business forms. XFDL allows the creation of powerful, complex forms that integrate with server-side applications such as workflow solutions, databases, and security structures. The latest version of the XFDL specification is Version 7, which was first released with IBM Workplace Forms 2.6 in September of 2006.

Capabilities

Unlike most XML derivatives, XFDL is a programming language that is smart enough to make decisions, handle arithmetic, and respond to user input. As XFDL directs users through the form interface, it is capable of performing calculations and providing error detection/correction on the fly. The computations needed for digital form functionality are built into each XFDL document, allowing it to function nomadically. See Figure 2-1.

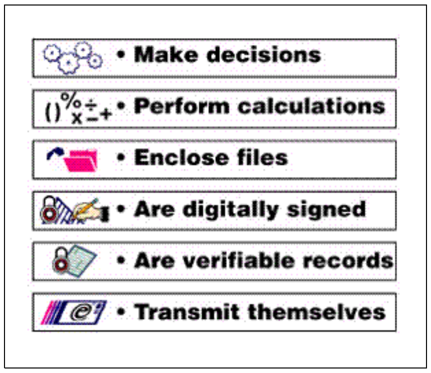


Figure 2-1 XFDL capabilities

XFDL is a tagged language, written as plain text. This means that you must use both opening and closing tags that are wrapped by angle brackets. Opening tags indicate the start of a specific form element. Closing tags, marked with a slash before the tag name, indicate the end of that description. Opening and closing tags surround information that describes a specific element of your form. For example, the following tags identify the form as XFDL and also give the namespaces used, and must appear at the beginning of the form (Example 2-1).

Example 2-1 XFDL form tag

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<XFDL xmlns="http://www.PureEdge.com/XFDL/6.5"
xmlns:custom="http://www.PureEdge.com/XFDL/Custom" xmlns:xfdl="http://www.PureEdge.com/
XFDL/6.5">
...Form Data...
</XFDL>
```

Example 2-2 shows the declaration of a date of birth display item. Looking at the XFDL source code for this item we can see all of its presentation properties, such as location, format, and font information, as well as a compute that determines that the item is visible only if the user selects yes in response to a question on the same page.

Example 2-2 XFDL display item

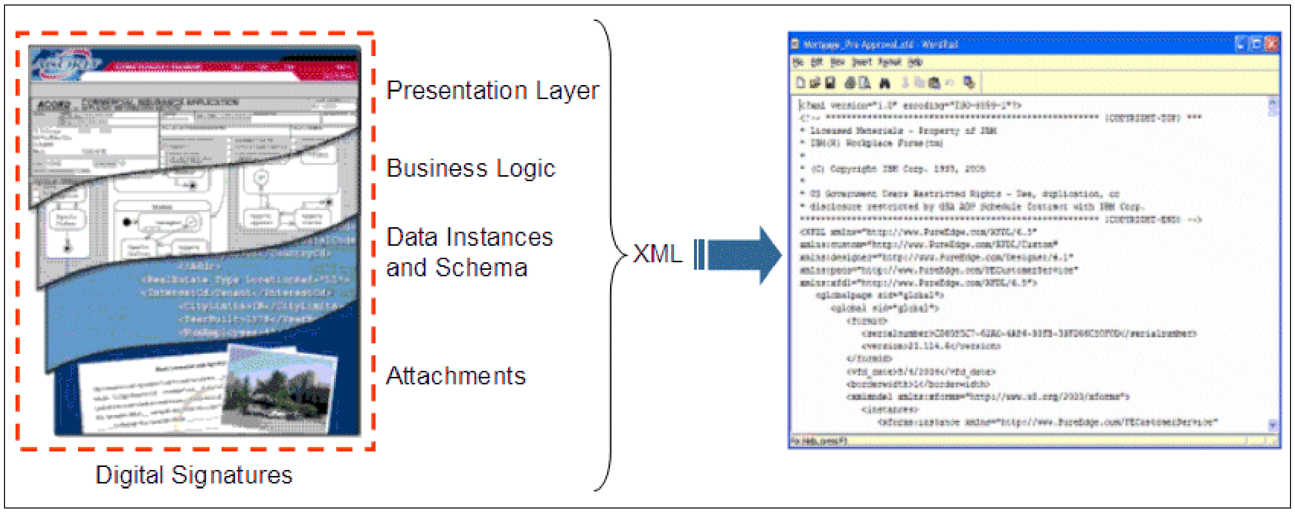
```
<combobox sid="DateofBirth">
   <itemlocation>
      <x>34</x>
      <y>50</y>
   </itemlocation>
   <value></value>
   <label>Date of Birth</label>
   <format>
      <datatype>date</datatype>
      <constraints>
         <mandatory>off</mandatory>
      </constraints>
      <presentation>
         <calendar>gregorian</calendar>
         <style>long</style>
      </presentation>
   </format>
   <help>dateOfBirthHelp1</help>
   <justify>right</justify>
   <border>on</border>
   <visible compute=" &#xA;
      PAGE1.RADIOYes.value == 'on' &#xA;
         ? ('on')  &#xA;
         : 'off' &#xA;
      ">on</visible>
   <fontinfo>
      <fontname>Arial</fontname>
      <size>8</size>
   </fontinfo>
   <active>on</active>
</combobox>
```

XFDL features

XFDL is a high-level computer language that provides the following features:

- Represents forms as a single object without dependencies on externally defined entities
- Is written in human-readable plain text
- Is publicly available as a W3C note (allowing you to create your own Viewer, Designer, and even APIs because all of the information is readily available)
- Provides a syntax for in-line mathematical and conditional expressions
- Permits the enclosure of an arbitrary size and number of base-64 encoded binary files (allowing attachment and conversion of external files such as photo identification, word processor documents, spreadsheets, and so on)
- Offers precision layout needed to represent and print near pixel perfect recreations of paper-based forms
- Facilitates server-side processing via client-side input validation and formatting
- Permits extensibility including custom items, options, and external code functions
- Offers comprehensive digital signature support including:
  - Capture of the whole context of a business transaction
  - Multiple signatures
  - Different signers of (possibly overlapping) portions of a form
  - Freezing computations on signed portions of a form

One of the most impressive features of the XFDL solution is that it provides full non-repudiation and auditability by storing the form template, data, internal logic, and file attachments in a single file that can be digitally signed. Each form is a single text file containing standard XML syntax, as shown in Figure 2-2.



```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!-- ************************************************************ (COPYRIGHT-TOP) ***
* Licensed Materials - Property of IBM
* IBM(R) Workplace Forms(tm)
*
* (C) Copyright IBM Corp. 1993, 2005
*
* US Government Users Restricted Rights - Use, duplication, or
* disclosure restricted by GSA ADP Schedule Contract with IBM Corp.
************************************************************** (COPYRIGHT-END) -->
<XFDL xmlns="http://www.PureEdge.com/XFDL/6.5"
xmlns:custom="http://www.PureEdge.com/XFDL/Custom"
xmlns:designer="http://www.PureEdge.com/Designer/6.1"
xmlns:pecs="http://www.PureEdge.com/PECustomerService"
xmlns:xfdl="http://www.PureEdge.com/XFDL/6.5">
   <globalpage sid="global">
      <global sid="global">
         <formid>
            <serialnumber>[illegible]</serialnumber>
            <version>21.114.4c</version>
         </formid>
         <vfd_date>8/4/2004</vfd_date>
         <borderwidth>1</borderwidth>
         <xmlmodel xmlns:xforms="http://www.w3.org/2003/xforms">
            <instances>
               <xforms:instance xmlns="http://www.PureEdge.com/PECustomerService"
```

Figure 2-2 Single file contains all Forms components in XFDL document

XFDL advantages

The advantages of XFDL and the benefits to the XForms specification include:

- Document-centricity.
- XFDL stores data in the document along with attachments, layout design, and form logic, creating a single record.
- Provides precision layout and printing.

- Can faithfully reproduce paper forms.
- Allows for the creation of wizard-based dynamic forms that can guide the user through the process of filling in and completing the form, changing on the fly, and reducing the number of errors.
- Has broad support for signatures.
- Locks both the XFDL components and the XForms data.
- Extension points for integration with other technologies. For example, you can embed JAR files in the form to extend functionality that would otherwise not be available.

A public copy of the XFDL specification can be found here:

`http://publibfp.boulder.ibm.com/epubs/pdf/22915350.pdf`

2.1.2 Workplace Forms component technology

Although a paper form is composed of paper and ink, its structure and content is made up of graphics and text. For example, a certain form may be three pages long and printed on grey paper. It also contains a number of carefully positioned labels and fields, and has different font colors for titles and text. A document replicates these elements electronically.

Documents are composed of five types of elements:

- Form

  The form itself. Every form has exactly one form element. Its purpose is to identify the code as an XFDL form.
- Page

  Every form contains at least one page. Pages control the background appearance of your form and contain your form items in much the same way paper pages do.
- Item

  The objects that appear on the page and make up the form content. These include fields, labels, and buttons.
- Option

  The elements that describe the appearance and actions of items. You can use options to set an item's color and font, or set the defaults for a print button.
- Argument

  Arguments contain the settings used by options. For example, arguments store the three numbers that make up an RGB value, such as 255, 255, and 255.

Another important concept to understand is that these elements are composed in a node structure that is the logical representation of the XFDL e-form. The tree is built as the form is read and defines the build order. Nodes of the same type always reside at the same level of the tree. XFDL elements must have a scope identifier, or SID, that uniquely identifies an element within the scope of its logical parent. Figure 2-3 illustrates the node structure.

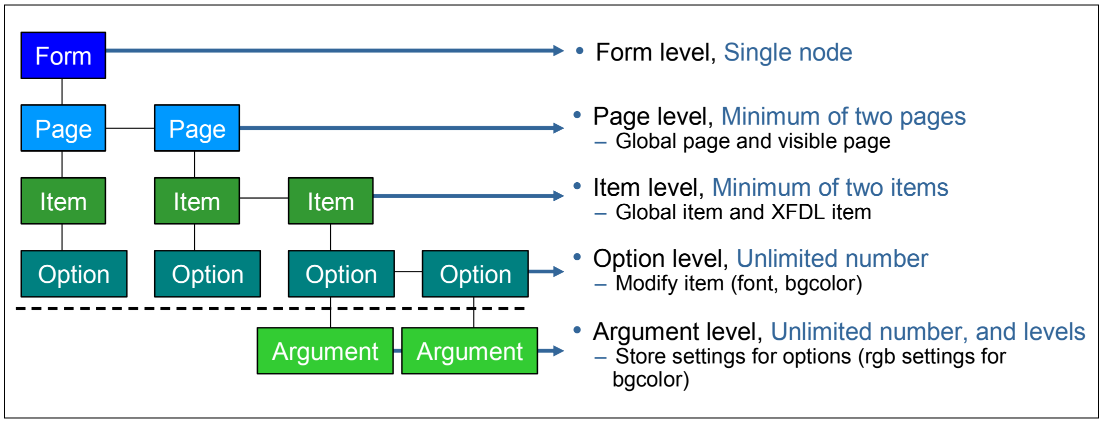

Form
Page
Page
Item
Item
Item
Option
Option
Option
Option
Argument
Argument
• Form level, Single node
• Page level, Minimum of two pages
– Global page and visible page
• Item level, Minimum of two items
– Global item and XFDL item
• Option level, Unlimited number
– Modify item (font, bgcolor)
• Argument level, Unlimited number, and levels
– Store settings for options (rgb settings for bgcolor)

Figure 2-3 Logical representation of form structure

2.1.3 XForms Model

Complex business forms cannot easily be represented with Hypertext Markup Language (HTML). As Web-based electronic forms have become more ubiquitous, XForms has emerged as a W3C specification for electronic forms to overcome limitations with HTML Forms. The XForms specification is a predefined set of tags, elements, and attributes that provides an extensible means to include richer, more dynamic forms than HTML documents, while at the same time making it faster and easier to create electronic forms.

Where HTML forms are created from elements that intermingle presentation and content, forms with XForms support differentiate a form's view into its presentation and purpose. XForms enables you to declare data items and structure separate from any set of widgets used to display the data values. Therefore, a form written with XForms can be written once and displayed in optimal ways on several different platforms.

The XForms Model represents the form's content and is composed of a form's data instance and logic components.

The form's data is contained within one or more instances. The data instance is defined within the model. Example 2-3 shows an XForms instance declaration that includes all the data necessary to process an order. This example will be used in the form scenario of this book.

Example 2-3 XForms Instance

```
<!-- Order Data. Information about this specific order including approvals and
timestamps.-->
   <xforms:instance id="FormOrderData" xmlns="">
      <FormOrderData>
         <ID></ID>
         <CustomerID></CustomerID>
         <Amount></Amount>
         <Discount></Discount>
         <SubmitterID></SubmitterID>
         <State></State>
         <CreationDate></CreationDate>
```

```
        <CompletionDate></CompletionDate>
        <Owner></Owner>
        <Version></Version>
        <Approver1></Approver1>
        <AppovalDate1></AppovalDate1>
        <Approver1Comment></Approver1Comment>
        <Approver2></Approver2>
        <AppovalDate2></AppovalDate2>
        <Approver2Comment></Approver2Comment>
        <Cost></Cost>
    </FormOrderData>
</xforms:instance>
```

Example 2-3 on page 24 represents all of the information that is passed to the back end and any temporary storage that is needed within the model.

XForms defines the means for binding these data items to the display widgets separately from the declaration of the data mode itself. Example 2-4 shows an XForms input field named “Savings” that has been bound to the discount data element using an XPath value for the reference (or “ref”). This bind dictates that the display field Savings will always show the value of the discount element contained in the instance, and conversely that any changes to the display field Savings will be captured as the value for the discount element.

Example 2-4 Bind to data item

```
<field sid="Savings">
   <xforms:input bind="CostSavings" ref="instance('FormOrderData')/Discount">
      <xforms:label></xforms:label>
   </xforms:input>
   <scrollhoriz>wordwrap</scrollhoriz>
   <itemlocation>
      <width>70</width>
      <before>FIELD1</before>
   </itemlocation>
   <format>
      <datatype>currency</datatype>
   </format>
   <readonly>on</readonly>
   <justify>right</justify>
</field>
```

Notice also that there is a bind, “CostSavings”, associated with this display element “Savings”. It is an XForms bind used to calculate the value of the data element and is part of the XForms Model, not the display item. It is a prime example of how the model can function independently of the display.

Binds, dependencies, and constraints

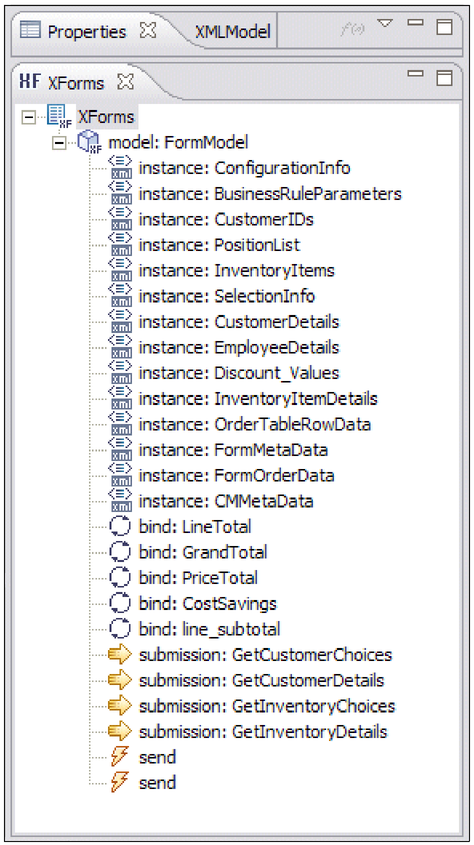
The form's logic components define its behavior. An XForms Model can define how it behaves when data is submitted, set initial values, and more. These logic components are defined with event handlers, data bindings, and submission information. You can bind values to instance data in XForms in two ways: data can be made dependent on other data, or it can be bound to input provided by the user.

Example 2-5 shows a XForms bind. If there are values, then it calculates the total price of the order based on the sum of each subtotal value contained in the rows of a table. Otherwise it sets the cost to zero.

Example 2-5 XForms bind

```
<xforms:bind calculate=" &#xA;
               if(instance('OrderTableRowData')/Row/line/subtotal='', '0', &#xA;
                   sum(instance('OrderTableRowData')/Row/line/subtotal))
                      " id="PriceTotal &#xA;
                      " nodeset="instance('FormOrderData')/Cost &#xA;
               "></xforms:bind>
```

One of the nice things about XForms is how much control it gives you over how the form is processed. For example, XForms exposes a tremendous number of events for which you can trap and perform specific actions. Figure 2-4 shows the model used for the form scenario used in this book. Notice that it includes not just instance declarations, but also submissions, binds, and other actions.



- XForms
  - model: FormModel
    - instance: ConfigurationInfo
    - instance: BusinessRuleParameters
    - instance: CustomerIDs
    - instance: PositionList
    - instance: InventoryItems
    - instance: SelectionInfo
    - instance: CustomerDetails
    - instance: EmployeeDetails
    - instance: Discount_Values
    - instance: InventoryItemDetails
    - instance: OrderTableRowData
    - instance: FormMetaData
    - instance: FormOrderData
    - instance: CMMetaData
    - bind: LineTotal
    - bind: GrandTotal
    - bind: PriceTotal
    - bind: CostSavings
    - bind: line_subtotal
    - submission: GetCustomerChoices
    - submission: GetCustomerDetails
    - submission: GetInventoryChoices
    - submission: GetInventoryDetails
    - send
    - send

Figure 2-4 XForms Model

See Chapter 3, “XForms” on page 133, for more detail on XForms.

2.2 Installing the software

In this section we explore the following topics:

- Installing the Designer
- Installing the Viewer

Introduction

Form authors use the Designer to create forms. In addition to easy item placement, alignment, and configuration, the Designer allows easy access to the underlying source code of forms, enabling the designers to include complex logic and calculations. The Designer works in tandem with the IBM Workplace Forms Viewer, which is now available inside the design environment.

Download the software

As stated previously, you must install both the IBM Workplace Forms Designer and the IBM Workplace Forms Viewer in order to create and view forms. If you do not already have the client tools installed, then you may obtain an evaluation copy that will provide you with a 60-day trial version of the tools. Use the link below to obtain the software:

`http://www-128.ibm.com/developerworks/downloads/wp/wpforms/`

2.2.1 Installing the Designer

The system requirements are:

- Supported operating systems
  - Microsoft Windows® 2000 with Service Pack 4
  - Microsoft Windows XP with Service Pack 1 or 2
- Minimum hardware requirements
  - Processor: 1 GHz
  - RAM: 1 GB
  - Disk space: 500 MB
  - Display resolution: 1024 x 768 in 16-bit color
- Recommended hardware requirements
  - Processor: 2 GHz
  - RAM: 2 GB
  - Disk space: 500 MB
  - Display resolution: 1280 x 1024 in 16-bit color
- Recommended software requirements

  You must install Workplace Forms Viewer 2.6 in order to preview forms in Workplace Forms Designer 2.6.
- Java

  The Workplace Forms Designer installer will install the IBM JVM™ 5.0.
- Eclipse

  The Workplace Forms Designer installer will install Eclipse 3.1.1.

To install the Designer:

1. Copy the installation program to your computer.

Important: Review the system requirements above before beginning the Designer installation.

2. Double-click the installation program to launch it.
3. The installer will step you through the installation. Be sure to:
   a. Click **Next** at the Welcome page.
   b. Accept the license agreement when prompted.
   c. Specify the installation directory, or accept the default path for the installation (C:\Program Files\IBM\Workplace Forms\Designer\2.6).
   d. The next screen will show summary information. Validate your path and the free space requirements (262.8 MB). Click **Install** to begin installation of the software.
4. Upon completion a summary screen will load. Review this information and click **Finish** to exit the installer.

2.2.2 Installing the Viewer

The system requirements are:

- Supported operating systems
  - Microsoft Windows 2000 with Service Pack 4
  - Microsoft Windows XP with Service Pack 1 or 2
- Hardware requirements
  - Processor: 500 MHz
  - RAM: 256 MB
  - Disk space: 200 MB
  - Display resolution: 800 x 600 in 16-bit color
- Supported Web browsers

  Workplace Forms Viewer can run stand-alone or within one of the following Web browsers:

  - Internet Explorer® 6.0 with Service Pack 1 on supported versions of Microsoft Windows (see supported operating systems above)
  - Internet Explorer 5.5 with Service Pack 2 on supported versions of Microsoft Windows (see supported operating systems above)
  - Internet Explorer 6.0 on Microsoft Windows XP with Service Pack 2
  - Firefox 1.5 on supported versions of Microsoft Windows (see supported operating systems above)
- Java

  The Workplace Forms Viewer installer will install the required IBM JVM 1.4.2.

  If you are deploying Workplace Forms Viewer to end-user machines via Workplace Forms Server - Deployment Server, the end-user machine must have the Sun or IBM JVM 1.3.1 or a later version up to JVM 5.0.
- Forms

  This version of Workplace Forms Viewer can be used with:

  - Forms written in XFDL Version 7.0 with or without XForms 1.0 (including international forms)

  - Forms written in XFDL Version 5.0 to 6.5
- Supported third-party products (optional)

  This version of the Workplace Forms Viewer is compatible with the following third-party products:

  - MSAA-compliant screen readers, such as JAWS, Windows-Eyes, or Narrator
  - Interlink ePad Signature hardware with Version 6.22 drivers
  - Topaz electronic signature hardware with Version 3.61 drivers
  - Any signature capture device compliant with WinTab Version 1.1
- Supported terminal services (optional)

  This version of Workplace Forms Viewer is compatible with the following terminal services: Windows Server® 2003 Terminal Services (set to 16-bit color or later)

To install the Viewer:

1. Copy the installation program to your computer.

   Important: Review the system requirements above before beginning the Viewer installation.

2. Go to the location where the installation files have been copied. Notice there are three executables. Those files are described in Table 2-1. For this installation we use WFViewer_261_Win32.exe to conduct a standard installation with language selection.

Table 2-1 Workplace Forms Viewer installation files

File name	Purpose
WFViewer_261_Win32.exe	Language select version of the installer
WFViewer_261_Win32_EN.exe	English-only version of installer
WFViewer_261_Win32_NOJVM.exe	Language select version of the installer without a JAVA Virtual Machine (JVM) included

3. Double-click the installation program **WFViewer_261_Win32.exe** to begin.
4. Choose **Setup Language** using the drop-down box.
5. Wait while the installer is prepared.
6. The installer will step you through the installation. Be sure to:
   a. Click **Next** on the Welcome screen.
   b. Accept the license agreement when prompted and click **Next**.
   c. Specify the installation directory or accept the default path for the installation (C:\Program Files\IBM\Workplace Forms\Viewer\2.6).
   d. The installation parameters are now complete. Click **Install** to continue, or **Back** to review or change any of your installation settings.

2.3 Introduction to the Designer

As with earlier versions of the IBM Workplace Forms Designer, Version 2.6.1 is a drag-and-drop design tool that allows form designers to create highly detailed, powerful XFDL forms with XForms support. However, with Release 2.6.1 the development environment has been migrated to the Eclipse Platform. This is a model-driven design environment with advanced layout functionality that allows component reuse, dynamic tables, and a run-time preview.

In this section we explore the following topics:

- Launch the Designer
- Brief overview of Eclipse
- Terminology for working in Eclipse
- Role-based perspectives
- Main panels
- Views

2.3.1 Launch the Designer

When you first start the Designer, there are some initial configurations that need to be completed. In this section we walk you through this initial setup.

Once you have installed both client tools, you can access the Designer from the Windows Start menu by selecting **Start** → **All Programs** → **IBM Workplace Forms Designer 2.6** → **IBM Workplace Forms Designer**.

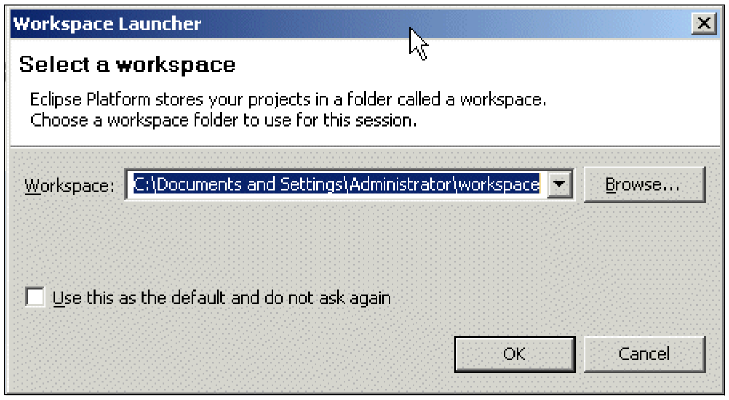
Note: To launch the viewer separately select **Start** → **All Programs** → **IBM Workplace Forms Designer 2.6** → **IBM Workplace Forms Viewer 2.6**.

First, you are prompted to select a *workspace*. The workspace is the folder where the Eclipse Platform stores your projects. You can have multiple workspaces for any number of projects. This is an important concept in the new Designer because it allows you and your team to easily manage not just the form file, but all files associated with a project such as a WSDL, graphics, and so on.

For the purposes of this book, we use the default location:

```
C:\Documents and Settings\Administrator\workspace
```

Then select the option to use this location as the default. See Figure 2-5.


Workspace Launcher

Select a workspace

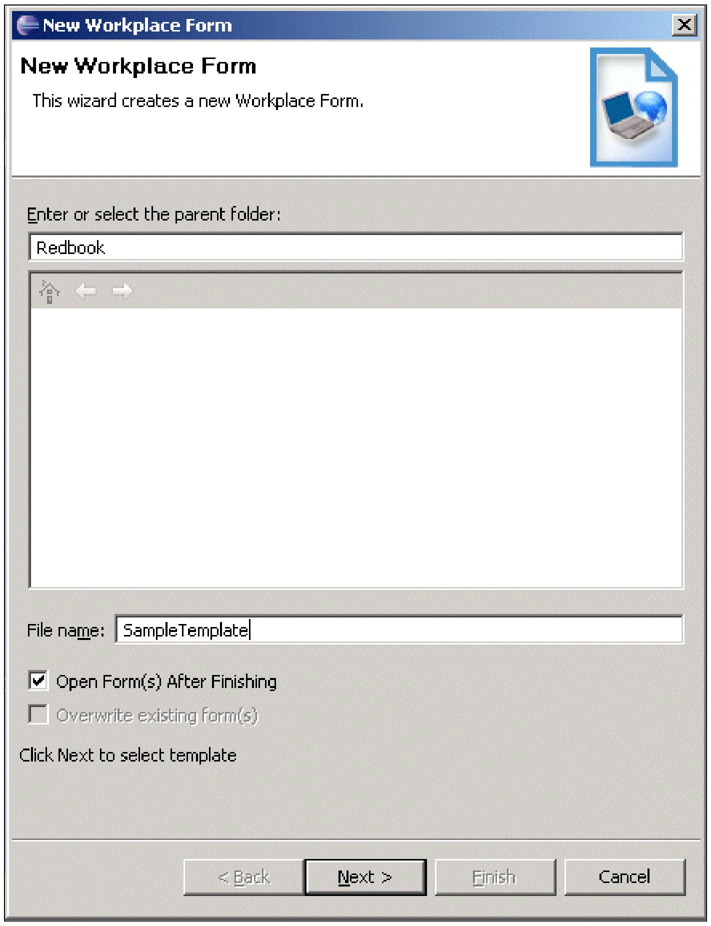
Eclipse Platform stores your projects in a folder called a workspace.
Choose a workspace folder to use for this session.

Workspace: C:\Documents and Settings\Administrator\workspace

Use this as the default and do not ask again

Figure 2-5 Workspace Launcher

Here we enter a parent folder to store the form, and give the form a name. We enter `Redbook` for the folder, and `SampleTemplate` for the form name, as shown in Figure 2-6.


New Workplace Form

New Workplace Form

This wizard creates a new Workplace Form.

Enter or select the parent folder: Redbook

File name: SampleTemplate

[✓] Open Form(s) After Finishing

[ ] Overwrite existing form(s)

Click Next to select template

Figure 2-6 New Workplace Form

The Welcome page loads, as shown in Figure 2-7. Click the **Create Form** icon to create a new Workplace Form. The **New Workplace Form** popup window is shown.

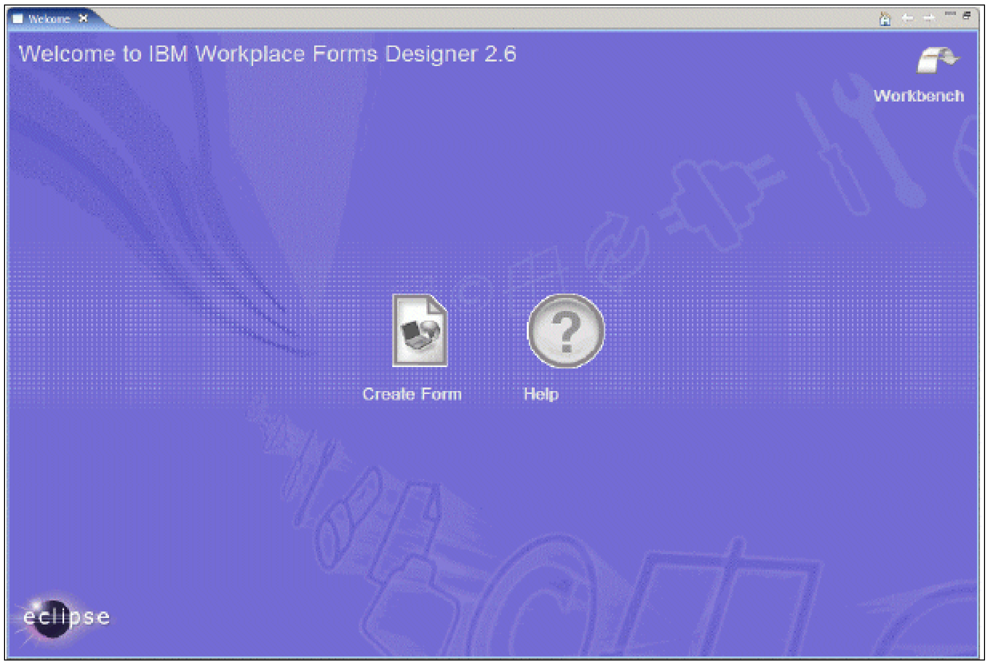


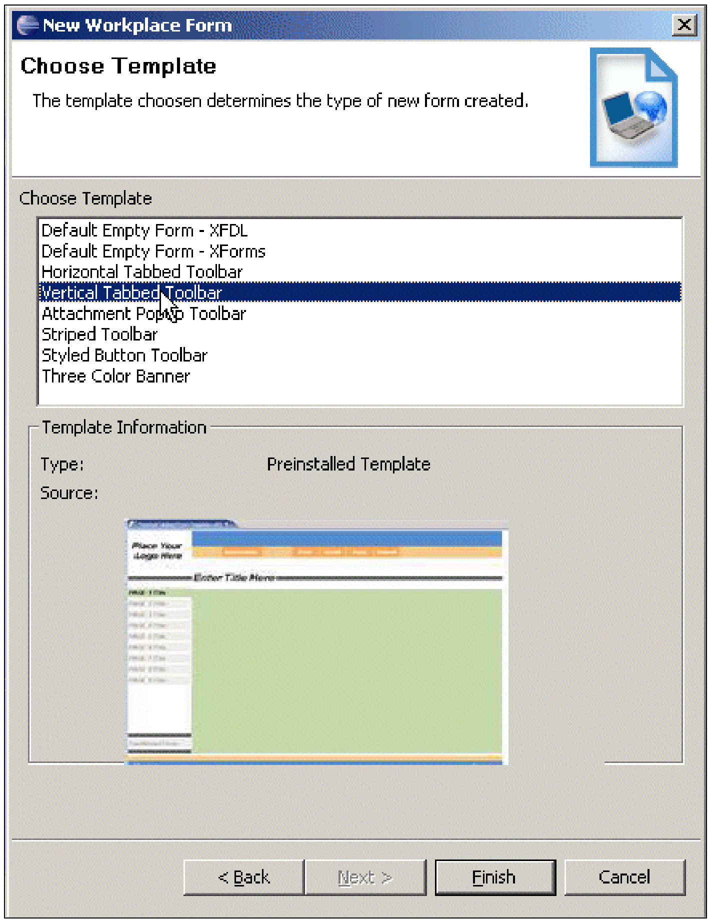
Figure 2-7 Welcome page

Next you are prompted to Choose a template. This is a new feature in Version 2.6.1 that lets the form author get a jump start on creating a new form. Also, these templates can be a great resource to show form designers how to create different types of forms. There are eight new templates to choose from:

- Default Empty From - XFDL
- Default Empty Form - XForms
- Horizontal Tabbed Toolbar
- Vertical Tabbed Toolbar
- Attachment Popup Toolbar
- Striped Toolbar
- Styled Button Toolbar
- Three Color Banner

Tip: You can create your own templates and previews in the Workplace Forms Designer to be used by you and your form design team, just as the development team has done with the out-of-the-box solution.

By default, an empty XFDL form template is highlighted and a preview is shown in the space below. Take a minute to look through the other eight templates and notice the previews as you go. For this book, we select the **Vertical Tabbed Toolbar.** See Figure 2-8.


New Workplace Form

Choose Template

The template choosen determines the type of new form created.

Choose Template

Default Empty Form - XFDL
Default Empty Form - XForms
Horizontal Tabbed Toolbar
Vertical Tabbed Toolbar
Attachment Popup Toolbar
Striped Toolbar
Styled Button Toolbar
Three Color Banner

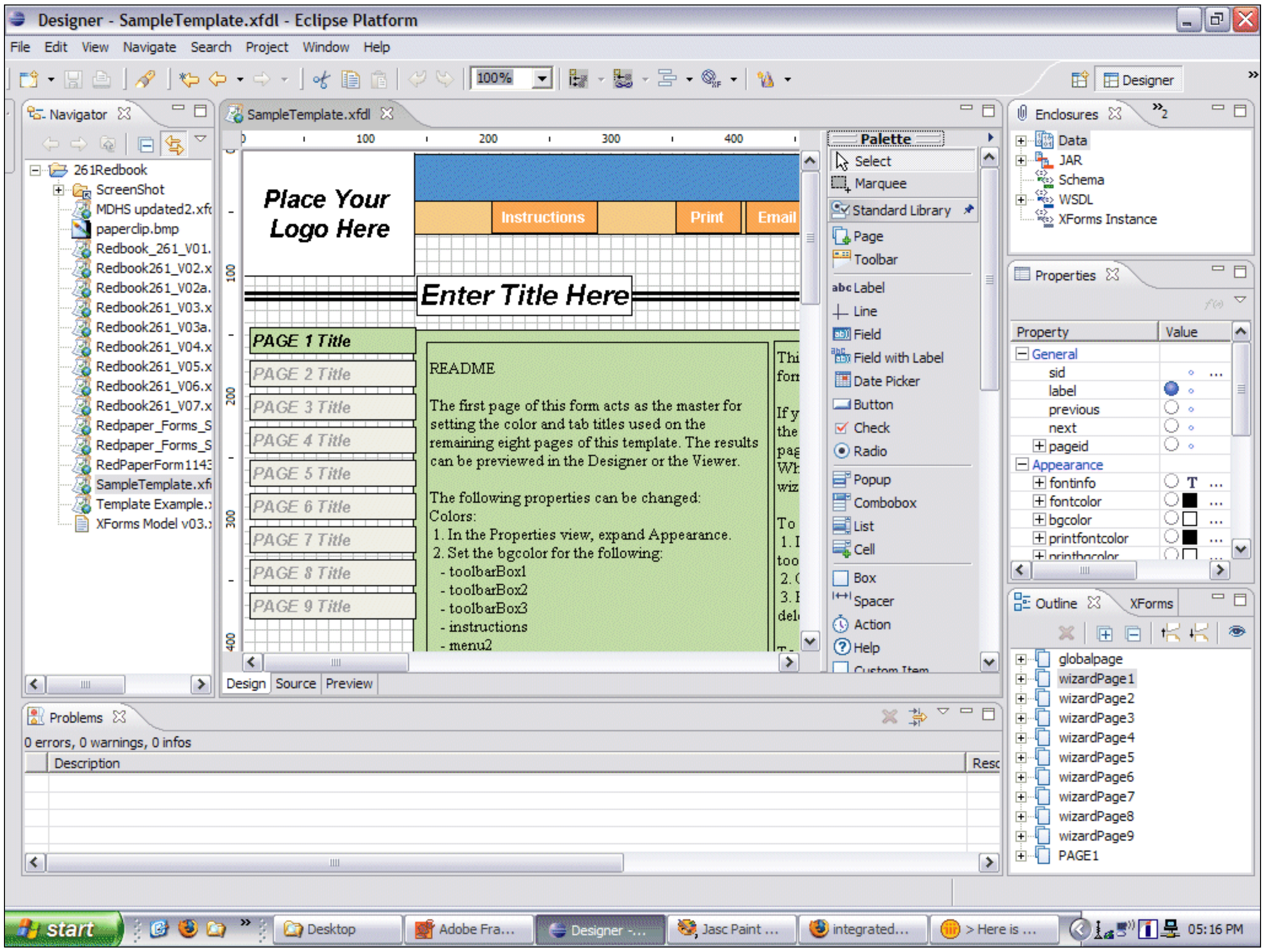
Template Information

Type: Preinstalled Template

Source:

Figure 2-8 Choose Template

One more panel appears, asking if you would like to switch to the Design perspective. Select the option to remember your decision and click **Yes**. We discuss the concept of perspectives in more detail later. The Designer now opens fully with your SampleTemplate.xfdl form loaded on the canvas, as shown in Figure 2-9.



README

The first page of this form acts as the master for setting the color and tab titles used on the remaining eight pages of this template. The results can be previewed in the Designer or the Viewer.

The following properties can be changed:
Colors:
1. In the Properties view, expand Appearance.
2. Set the bgcolor for the following:
- toolbarBox1
- toolbarBox2
- toolbarBox3
- instructions
- menu2

Figure 2-9 Default view

In the next section we introduce you to the new Eclipse Platform for the IBM Workplace Forms Designer.

2.3.2 Brief overview of Eclipse

The Eclipse Platform builds confidence and trust by providing the source code for the platform. Software developers are tired of integrating tools and trying to deconstruct how to make tools work together in an environment. Making the Eclipse Platform an open source initiative enables tool developers to do the same and to not only contribute new plug-ins but to also help improve the existing platform.

Users of Eclipse-based offerings benefit from:

- Access to research and knowledge from the entire Eclipse ecosystem.
- Higher-quality software that comes under scrutiny from the eyes of the open source community.
- The ability to reuse skills because of the consistent Eclipse interface.

Java technology developers using Eclipse benefit from:

- A world-class Java IDE
- Native look and feel across platform
- Easy extensions to Java tooling

Developers of Eclipse tools benefit from:

- A portable and customizable platform
- Seamless tool integration
- An end-to-end solution

IBM is the originator of the Eclipse Platform. The platform began development by Object Technology International in 1998 (a subsidiary of IBM purchased in 1996, now known as the IBM Ottawa Lab) to address the problems raised by customers that dealt with the cohesiveness of IBM software tooling. Customers complained that IBM tooling looked like it came from different companies and did not work together.

In 2001, IBM established the Eclipse consortium and gave the gift of Eclipse to the open source community. The goal was to let the open source community control the code and let the consortium deal with commercial relations. There were nine initial members of the consortium, which included IBM partners and competitors. IBM continued to nurture the evolution of the platform by funding various programs like Eclipse innovation grants and sponsoring Eclipse code camps. The platform was developed using an open source model through an open source license where anyone is welcome to participate.

IBM wanted more serious commitment from vendors, but vendors perceived the Eclipse consortium as IBM-controlled and were reluctant to make a strategic commitment while IBM was in control. To resolve these problems, IBM relinquished any control. With the support of many companies, the Eclipse Foundation was formed in 2004 as a not-for-profit organization with a dedicated professional staff.

Today, IBM is committed to Eclipse more than ever and takes an active part in the Eclipse Foundation as a strategic member. Furthermore, IBM has more developers contributing to Eclipse than any other vendor.

Essential to the success of the Eclipse Platform are three intertwined communities:

- Committers: An open, active, inclusive community of committers responsible for developing official Eclipse tooling. An example group of committers is the Eclipse Web Tools Platform project team.
- Plug-in developers: A community that exists outside the committer community that extends the platform to create useful tooling. Eclipse Plug-in Central contains a large sampling of plug-in developers.
- Users: A community composed of people who use the tooling developed by committers and plug-in developers.

2.3.3 Terminology for working in Eclipse

An explanation of the following terms will be useful as you begin working in the Eclipse development environment:

- Workbench
- Workspace
- Perspective

The Eclipse development environment (and Eclipse applications) runs inside an environment called a *workbench*. The workbench is a collection of toolbars, menus, and one or more *perspectives*. Essentially, you can think of the workbench as the Eclipse Integrated Development Environment (IDE). When starting a new project, you can create a specific profile for a development project, known as a *workspace*.

Eclipse is an open source Integrated Development Environment (IDE) that provides a framework to build rich Java-based applications. It provides application building blocks (UI constructs, runtime, help mechanism, and so on) and an extensible framework for creating Workplace Forms. To learn more about Eclipse and its open source community visit:

`http://www.eclipse.org/`

In the Eclipse IDE, you can associate development profiles (workspaces) to run inside the workbench.

Note: For additional resources to better understand Eclipse Development techniques and terminology, refer to the following resources:

- D'Anjou, Jim; Fairbother, Scott; Kehn, Dan; Kellerman, John; McCarthy, Pat. *The Java Developer's Guide to Eclipse*. Second Edition. Addison-Wesley. Boston, 2005
- Carlson, David. *Eclipse Distilled*. Addison Wesley Professional. Boston, 2005

Although this new platform provides greater flexibility and power, initially it can be intimidating to users who are not familiar with the Eclipse layout. For many, this environment is very familiar and these users find the transition very comfortable. For those who have not worked with the Eclipse Platform previously, the first impression is that the environment has been geared more toward professional developers, but that is not entirely true. The new Designer was created to provide a role-based forms development platform where teams can work together sharing their individual skills. Team members can tailor their Eclipse perspectives as required to optimize their environment.

Authors can work in unique environments that are specific to their individual roles, while working within the Eclipse Project paradigm and leveraging standard Eclipse plug-ins like CVS (a version control tool). These interface layouts are called *perspectives*. In the IBM Workplace Forms Designer, there are five standard perspectives, all of which can be customized:

- CVS Repository Exploring
- Debug
- Designer
- Resources (default)
- Team Synchronizing

Furthermore, every one of the perspectives listed above can be modified to include or exclude *views*. There are a number of different views in the Designer that can be minimized, maximized, rearranged, added, and removed at any time. Figure 2-10 shows a list of these views.

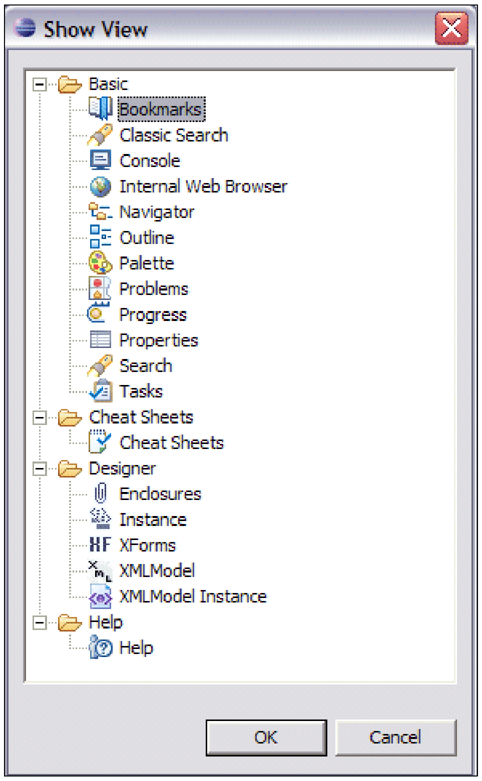


Figure 2-10 Designer views

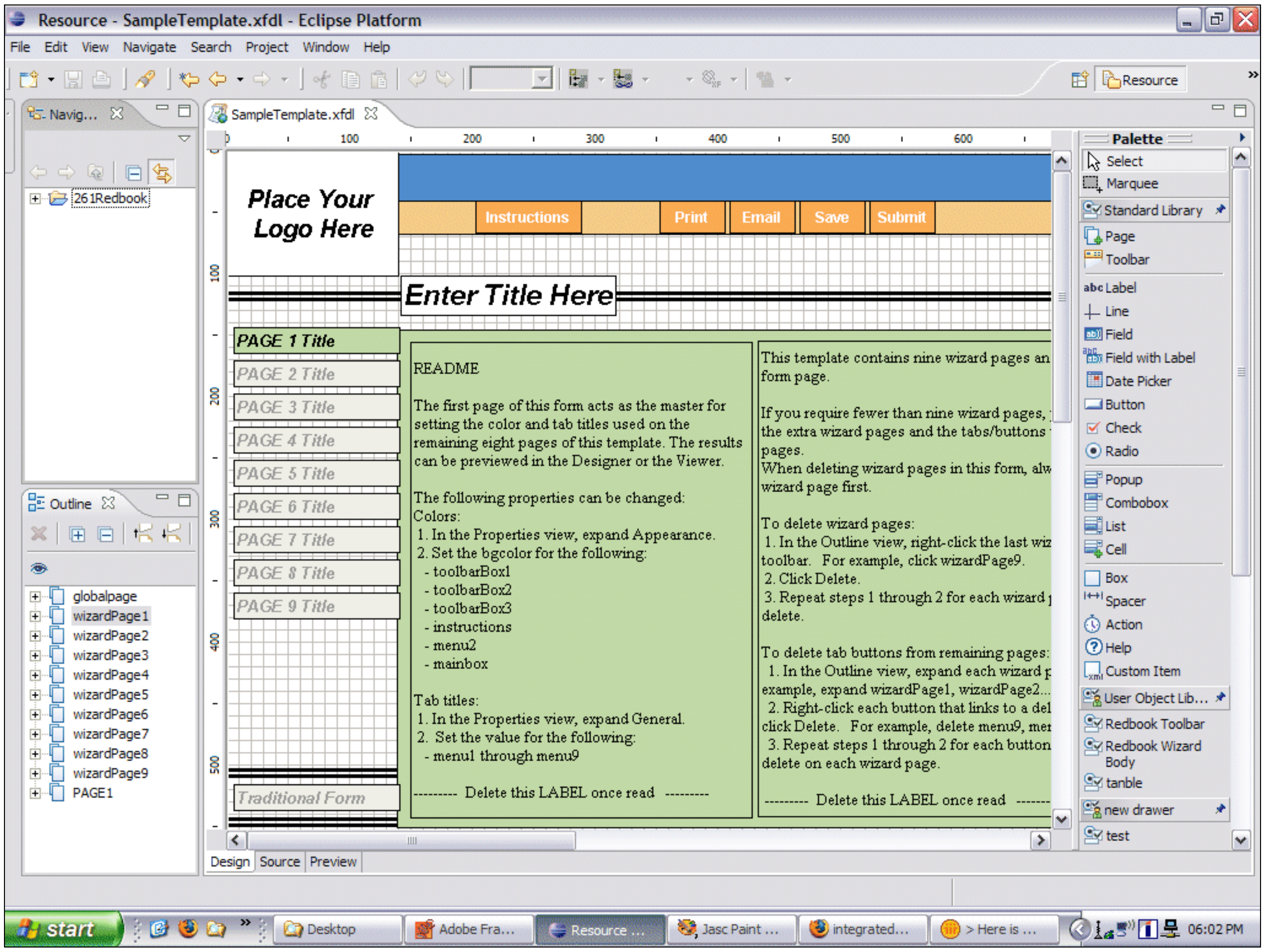
2.3.4 Role-based perspectives

Consider the three roles outlined in Table 2-2.

Table 2-2 Role-based form development

Role	**Responsibility**
Business analyst	Creates the business rules appropriate to the workflow, and process of the form
Data analyst	IT developer who might get the XML schemas necessary to integrate with back-end systems
Forms designer/professional	Designs presentation layer, or form layout

For example, a team member in the role of forms designer/professional may configure her environment to show a simple interface with only the essential tools needed to do her job, as shown in Figure 2-11.



README

The first page of this form acts as the master for setting the color and tab titles used on the remaining eight pages of this template. The results can be previewed in the Designer or the Viewer.

The following properties can be changed:
Colors:
1. In the Properties view, expand Appearance.
2. Set the bgcolor for the following:
- toolbarBox1
- toolbarBox2
- toolbarBox3
- instructions
- menu2
- mainbox

Tab titles:
1. In the Properties view, expand General.
2. Set the value for the following:
- menu1 through menu9

--------- Delete this LABEL once read ---------

This template contains nine wizard pages an
form page.

If you require fewer than nine wizard pages,
the extra wizard pages and the tabs/buttons
pages.
When deleting wizard pages in this form, alw
wizard page first.

To delete wizard pages:
1. In the Outline view, right-click the last wiz
toolbar. For example, click wizardPage9.
2. Click Delete.
3. Repeat steps 1 through 2 for each wizard
delete.

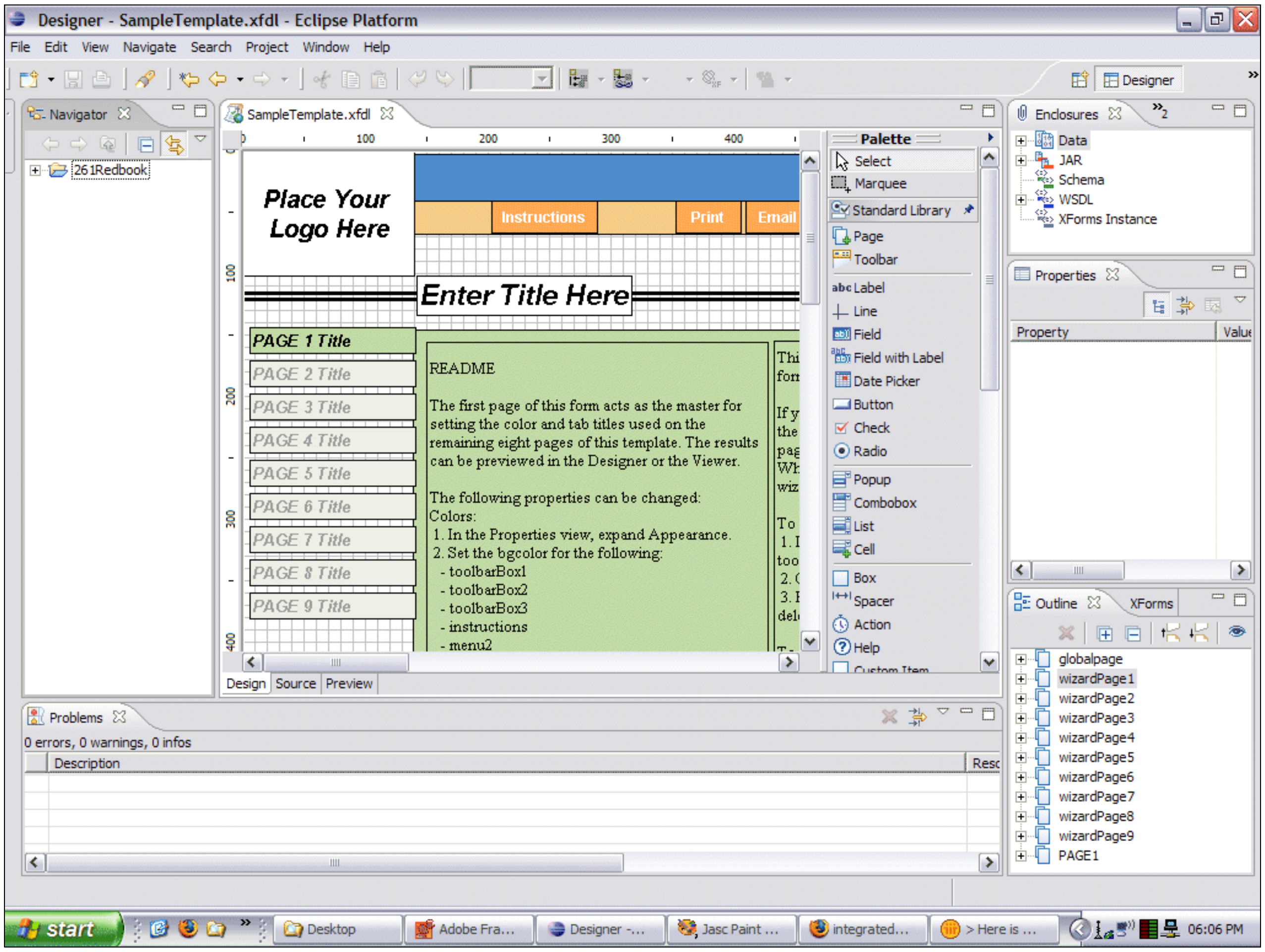
To delete tab buttons from remaining pages:
1. In the Outline view, expand each wizard p
example, expand wizardPage1, wizardPage2...
2. Right-click each button that links to a del
click Delete. For example, delete menu9, me
3. Repeat steps 1 through 2 for each button
delete on each wizard page.

--------- Delete this LABEL once read -------

Figure 2-11 Forms designer/professional perspective

The perspective shown in Figure 2-11 is in fact a customized version of the default resource perspective.

At the other end of the spectrum, a data analyst may have a much more robust interface with the many tools necessary to fill their more IT-centric role. In that case, they would likely use the Design perspective, as shown in Figure 2-12.



README

The first page of this form acts as the master for setting the color and tab titles used on the remaining eight pages of this template. The results can be previewed in the Designer or the Viewer.

The following properties can be changed:
Colors:
1. In the Properties view, expand Appearance.
2. Set the bgcolor for the following:
- toolbarBox1
- toolbarBox2
- toolbarBox3
- instructions
- menu2

```
0 errors, 0 warnings, 0 infos
```

Figure 2-12 Forms data analyst resource perspective

This environment is flexible enough to meet the needs for all team members without overwhelming casual designers or limiting functionality for advanced users.

2.3.5 Main panels

The Workplace Forms Designer has three main panels that allow form authors to control every aspect of their form from precision layout to complex computes.

In this section we cover the following:

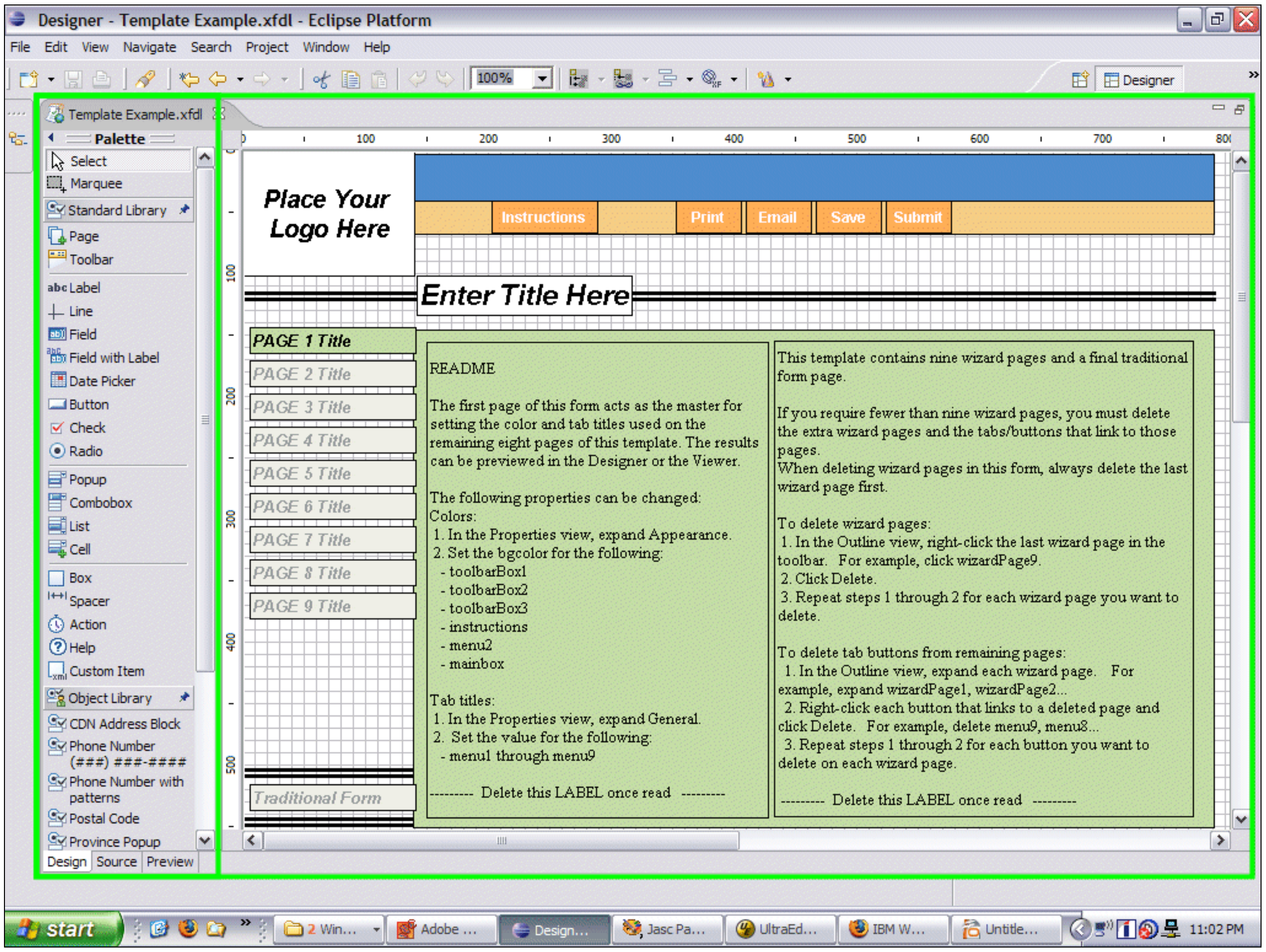
- Design panel
- The palette
- Form source
- Form preview

Design panel

Use the Design panel to create and edit the visual components of your forms. The Design panel consists of two parts:

- The canvas: the area where you design the visual components of your forms
- The palette: contains the items you can add to the form

Figure 2-13 shows the primary interface used by forms, which offers easy item placement, alignment, and configuration.



README

The first page of this form acts as the master for setting the color and tab titles used on the remaining eight pages of this template. The results can be previewed in the Designer or the Viewer.

The following properties can be changed:
Colors:
1. In the Properties view, expand Appearance.
2. Set the bgcolor for the following:
- toolbarBox1
- toolbarBox2
- toolbarBox3
- instructions
- menu2
- mainbox

Tab titles:
1. In the Properties view, expand General.
2. Set the value for the following:
- menu1 through menu9

--------- Delete this LABEL once read ---------

This template contains nine wizard pages and a final traditional form page.

If you require fewer than nine wizard pages, you must delete the extra wizard pages and the tabs/buttons that link to those pages.
When deleting wizard pages in this form, always delete the last wizard page first.

To delete wizard pages:
1. In the Outline view, right-click the last wizard page in the toolbar. For example, click wizardPage9.
2. Click Delete.
3. Repeat steps 1 through 2 for each wizard page you want to delete.

To delete tab buttons from remaining pages:
1. In the Outline view, expand each wizard page. For example, expand wizardPage1, wizardPage2...
2. Right-click each button that links to a deleted page and click Delete. For example, delete menu9, menu8...
3. Repeat steps 1 through 2 for each button you want to delete on each wizard page.

--------- Delete this LABEL once read ---------

Figure 2-13 Form Design canvas

The canvas on the Design tab of the Editor view allows you to place, resize, cut, copy, and paste items here. It only shows one page of your form at a time, but additional pages are accessed by either using the PgUp or PgDn keys, or selecting **View** → **Previous Page** or **View** → **Next Page**. The canvas offers item layout and arrangement tools, including zoom functionality.

The palette

The palette is the part of the Editor view that contains all of the user input and layout items, allowing you to select and place items onto the canvas with your mouse.

Palette layout

The palette's layout setting controls how the icons and names of the item buttons are displayed in the palette's libraries. You can choose one of the layout options listed in Table 2-3.

Table 2-3 Palette layout

Layout	Description
Columns	Icons and names are displayed in two columns.
List	Icons and names are displayed in a list.
Icons only	Only the icons are displayed.
Details	Icons, names, and descriptions are displayed in a list.

Note: The palette's current layout is marked by a check.

To change the palette layout right-click the **Palette**, point to Layout, and then choose the desired layout. To revert to the smaller icon size, clear the check box. Figure 2-14 shows the different layout views of the palette.

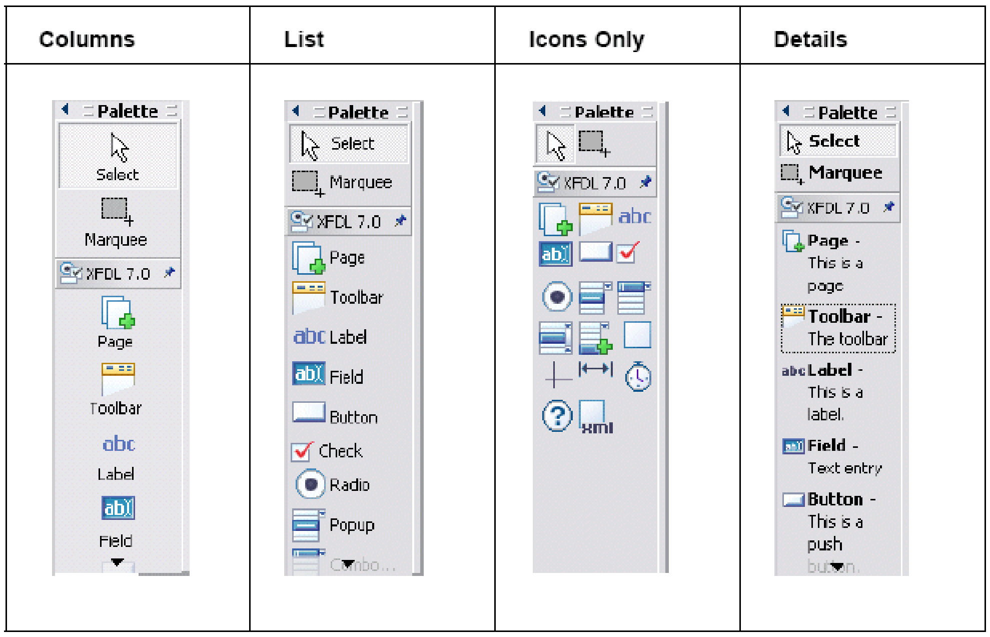


Figure 2-14 Palette layouts

Libraries

Creation tools are grouped within libraries and shown in the palette. The palette contains two default libraries, and one or more optional custom libraries contained within their own drawers. Palette libraries expand or collapse dynamically. If you open a library, other libraries automatically close. If you do not want a library to close, you can pin a library so that it does not collapse when you expand another library.

Note: Libraries are sometimes referred to as *drawers* when shown in the palette.

- Standard library: contains tools that let you create simple form items
- Object library: contains tools that let you create complex pre-defined XFDL objects that are composed of several items
- Custom library: contains tools that you or your team create and want to reuse and maintain

Note: If you currently have a form open, you must reopen that form before seeing the changes in the palette.

Standard library

Figure 2-15 shows the standard item library for XFDL-only items.

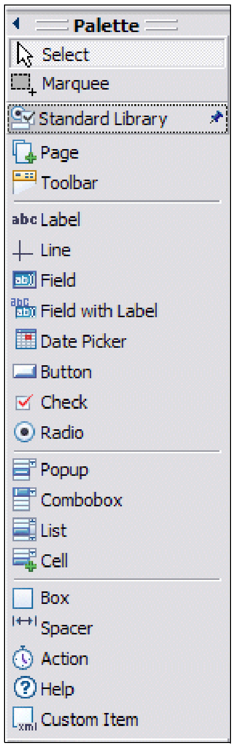


Figure 2-15 Palette views

Input items, such as fields, check boxes, and combo boxes, allow users to enter data. Layout items, such as lines, labels, and boxes, are used to provide visual effects in forms.

Object library

A new feature available with IBM Workplace Forms Version 2.6.1 is the object library, which contains predefined items and groups of items available for reuse in your form design. Figure 2-16 shows a list of all of the predefined objects that are shipped with the current release.

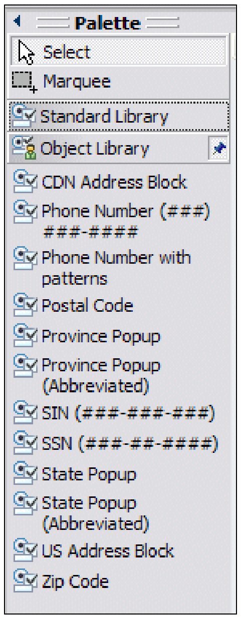


Figure 2-16 Object library

The items contained in this library have predefined alignment, constraints, and many other properties. When you select one from the palette and add it to your form, the new items created on your form will inherit all the same properties.

Custom library

You can create your own custom library containing commonly used items to drag and drop onto your canvas. These saved items or group of items are saved as objects and can then be reused in any forms you are developing.

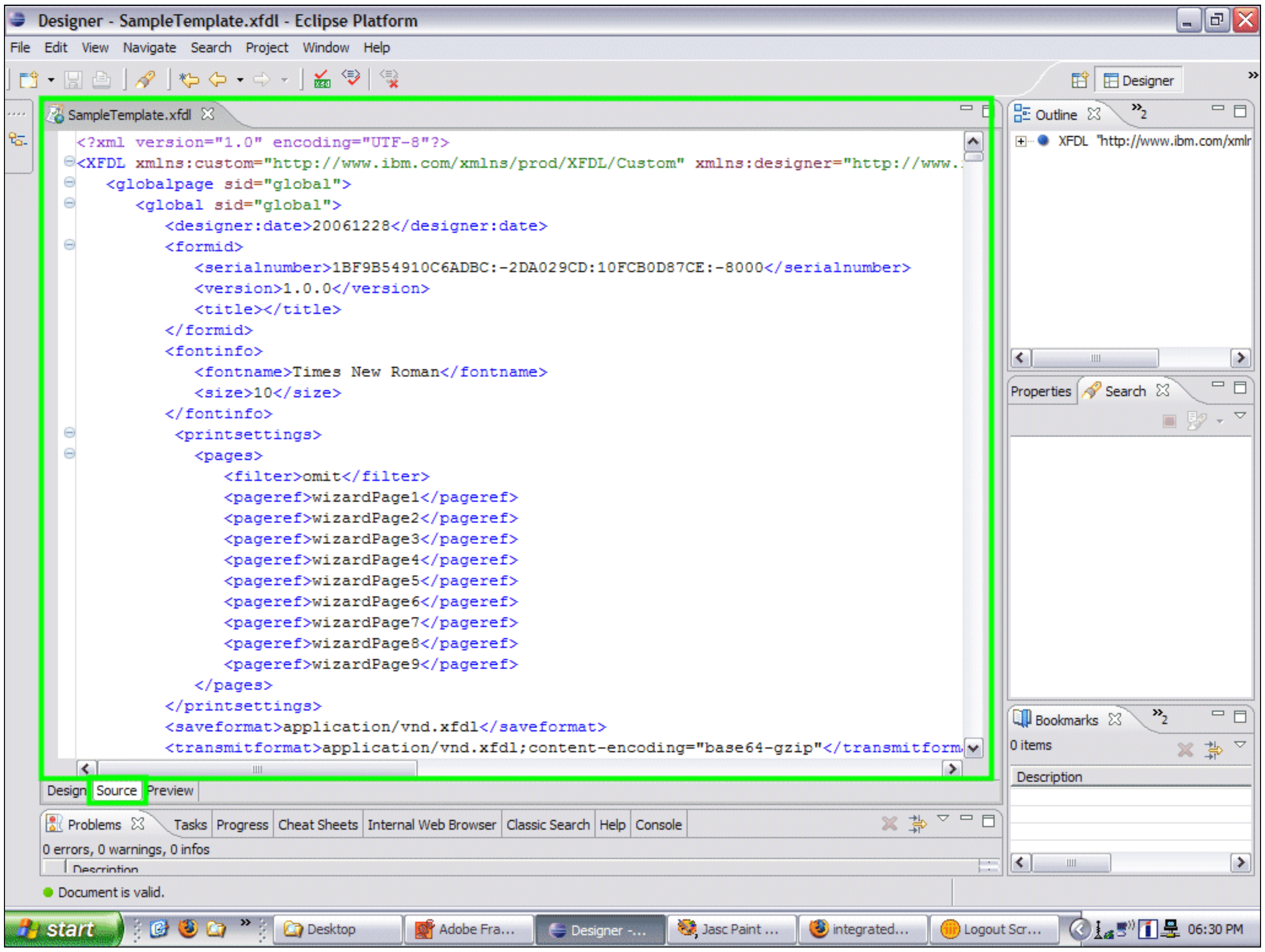
This is useful if you use an item or group of items often and you want to maintain design standards in another form.

1. Click **Windows** → **Preferences** to open the Preferences window.
2. In the left column, expand **Workplace Forms**.
3. Click **Form Object Library**.
4. Click **New** to add directories of object items to add to the palette user object library.
5. Browse to the directory of object items that you want to use. Multiple directories can be used from your local drive and shared network computers.
6. Click **OK**.
   - If you want to change the order of the object libraries displayed in the palette, click **Up** and **Down**.
   - If you want to remove a directory of object libraries listed in the palette, select the directory and then click **Remove**.
   - If you want to restore directories of your object items listed in the palette, click **Restore Defaults**.

7. Click **OK** to close the Preference window.

Form source

The Source Code Editor panel, shown in Figure 2-17, allows users access to the source code. This grants users the opportunity to make changes directly in the code.

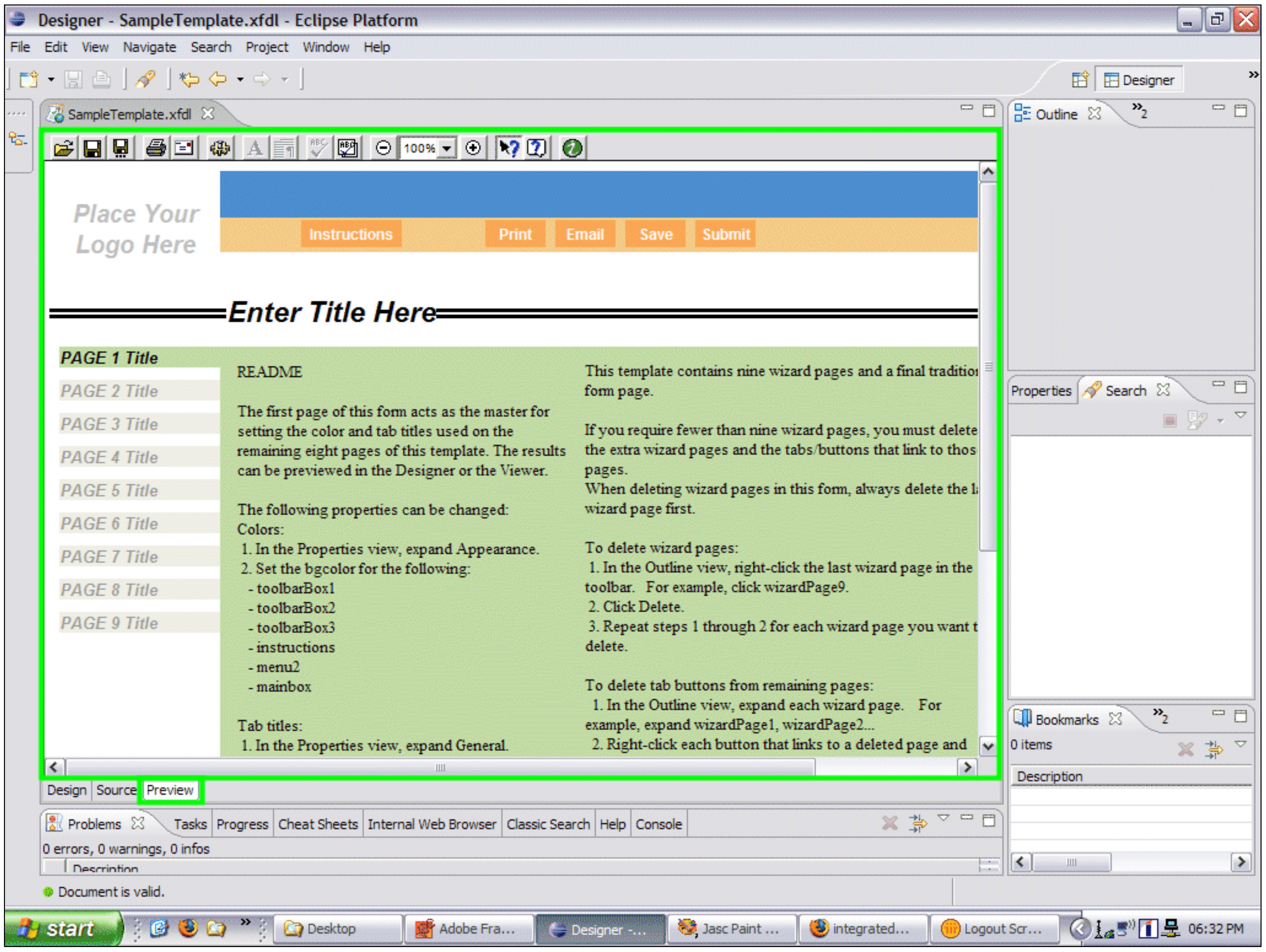

Designer - SampleTemplate.xfdl - Eclipse Platform
File Edit View Navigate Search Project Window Help
Designer
SampleTemplate.xfdl
Outline
XFDL "http://www.ibm.com/xmlr
Properties
Search
Bookmarks
0 items
Description
Design Source Preview
Problems Tasks Progress Cheat Sheets Internal Web Browser Classic Search Help Console
0 errors, 0 warnings, 0 infos
Description
Document is valid.
start
Desktop
Adobe Fra...
Designer -...
Jasc Paint ...
integrated...
Logout Scr...
06:30 PM

```
<?xml version="1.0" encoding="UTF-8"?>
<XFDL xmlns:custom="http://www.ibm.com/xmlns/prod/XFDL/Custom" xmlns:designer="http://www..
   <globalpage sid="global">
      <global sid="global">
         <designer:date>20061228</designer:date>
         <formid>
            <serialnumber>1BF9B54910C6ADBC:-2DA029CD:10FCB0D87CE:-8000</serialnumber>
            <version>1.0.0</version>
            <title></title>
         </formid>
         <fontinfo>
            <fontname>Times New Roman</fontname>
            <size>10</size>
         </fontinfo>
          <printsettings>
            <pages>
               <filter>omit</filter>
               <pageref>wizardPage1</pageref>
               <pageref>wizardPage2</pageref>
               <pageref>wizardPage3</pageref>
               <pageref>wizardPage4</pageref>
               <pageref>wizardPage5</pageref>
               <pageref>wizardPage6</pageref>
               <pageref>wizardPage7</pageref>
               <pageref>wizardPage8</pageref>
               <pageref>wizardPage9</pageref>
            </pages>
         </printsettings>
         <saveformat>application/vnd.xfdl</saveformat>
         <transmitformat>application/vnd.xfdl;content-encoding="base64-gzip"</transmitform
```

Figure 2-17   Source editor

Form preview

Figure 2-18 shows a new panel available in the Designer. This new feature allows the form designer to preview forms without having to launch the viewer as a separate application, making the validation of form appearance, layout, and logic much easier and more efficient.



README

The first page of this form acts as the master for setting the color and tab titles used on the remaining eight pages of this template. The results can be previewed in the Designer or the Viewer.

The following properties can be changed:
Colors:
1. In the Properties view, expand Appearance.
2. Set the bgcolor for the following:
- toolbarBox1
- toolbarBox2
- toolbarBox3
- instructions
- menu2
- mainbox

Tab titles:
1. In the Properties view, expand General.

This template contains nine wizard pages and a final traditio
form page.

If you require fewer than nine wizard pages, you must delete
the extra wizard pages and the tabs/buttons that link to thos
pages.
When deleting wizard pages in this form, always delete the l
wizard page first.

To delete wizard pages:
1. In the Outline view, right-click the last wizard page in the toolbar. For example, click wizardPage9.
2. Click Delete.
3. Repeat steps 1 through 2 for each wizard page you want t
delete.

To delete tab buttons from remaining pages:
1. In the Outline view, expand each wizard page. For example, expand wizardPage1, wizardPage2...
2. Right-click each button that links to a deleted page and

0 errors, 0 warnings, 0 infos

Description

Document is valid.

Figure 2-18 Viewer in Designer

2.3.6 Views

The Eclipse Workbench interface is comprised of views and the editor pane discussed in the prior section.

A view is a tabbed window that groups similar information together. For example, the Properties view is a context-sensitive view that displays the properties of whatever object is selected in the Designer, the Navigator view lists all of the files and folders associated with your project, and the Enclosures view displays all of the files that are enclosed within the form. See Figure 2-19 for a breakdown of the view components described in this section.

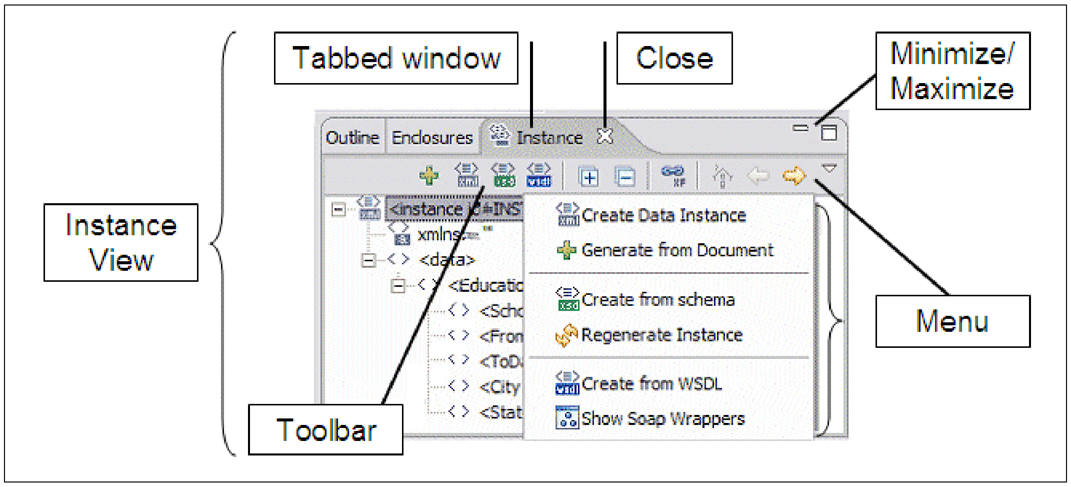


Figure 2-19 Components of a view

Depending on the design perspective, a view window may appear by itself or tabbed with other views.

Many views (like other application windows) have their own unique menus. If available, a down arrow button will be located to the top right of a view's title bar. To open the menu for a view, click that down arrow. Some views even have their own toolbars.

You can open and close views, and dock them in different positions in the workbench.

Main Designer views

This section describes the main Designer views:

- ► Navigator view
- ► Outline view
- ► Properties view
- ► Problems view
- ► Figure on page 48

Navigator view

The Navigator view lists the folders and files in your project, as shown in Figure 2-20.

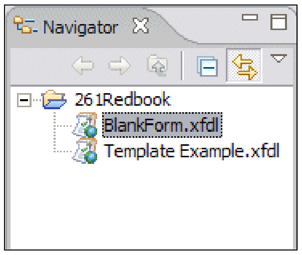


Figure 2-20 Navigator view

Using this view, you can open files; copy, move, or create new resources; select resources for importing or exporting; and compare and replace resources. Most of these operations can be accessed by right-clicking in the Navigator view.

Outline view

The Outline view displays the hierarchical structure of your form, as shown in Figure 2-21. You can expand or contract the outline to see more or less detail in the form.

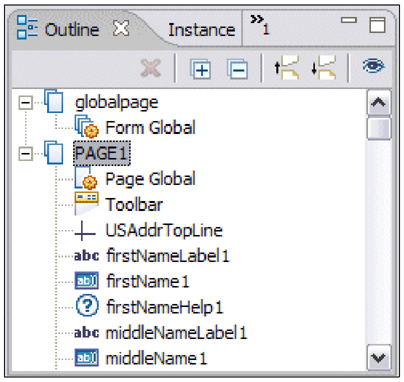


Figure 2-21 Outline view

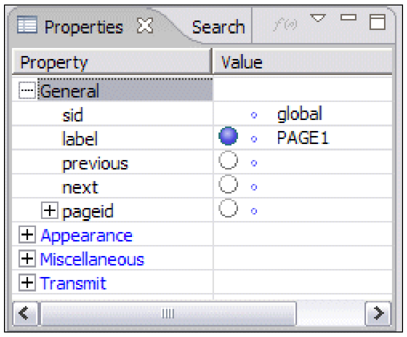
Clicking an item in the Outline view highlights the item on the canvas or in the Source panel, and displays its options in the Properties view.

Tip: The Outline view is very useful for accessing non-visible items in a form, such as form and page globals. You can also use the Outline view to move to pages in a multi-page form.

The Outline view's contents and toolbar will vary depending on whether you are working in the Design panel or Source panel.

Properties view

The Properties view displays the properties you can set for a selected form item or object. The list of properties varies depending on what is selected in the Designer. Figure 2-22 shows a compressed view of the PAGE1 properties.

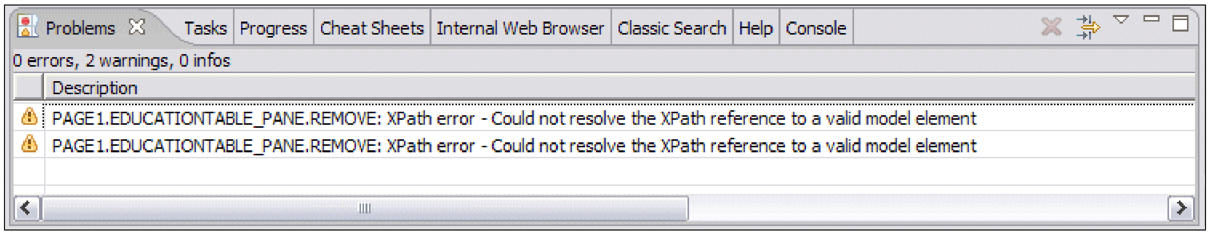


Property	Value
General	
sid	global
label	PAGE1
previous	
next	
pageid	
Appearance	
Miscellaneous	
Transmit	

Figure 2-22 Properties view

Problems view

The Problems view (shown in Figure 2-23) displays errors, warnings, and other information whenever you check your form or switch from the Source panel to the Design panel. This figure shows two warnings.



0 errors, 2 warnings, 0 infos

PAGE1.EDUCATIONTABLE_PANE.REMOVE: XPath error - Could not resolve the XPath reference to a valid model element

PAGE1.EDUCATIONTABLE_PANE.REMOVE: XPath error - Could not resolve the XPath reference to a valid model element

Figure 2-23 Problems view

Table 2-4 provides a description of the types of problems that may be displayed in this view.

Table 2-4 Problem types

Type	Description
Errors	Errors are problems that make the form impossible to use. The Viewer cannot open forms with these errors. When you receive an error message, you will also be given information about which of the form's items or settings is causing the problem.
Warnings	Warnings are reported when the Designer finds an item or property setting that is either incorrect or not part of standard XFDL. For example, the following problem was detected or the referenced item does not exist. The form can be opened with these types of problems.
Info	General tips and tricks information.

Enclosures view

You can use the Enclosures view to enclose files within your form. The view is shown in Figure 2-24.

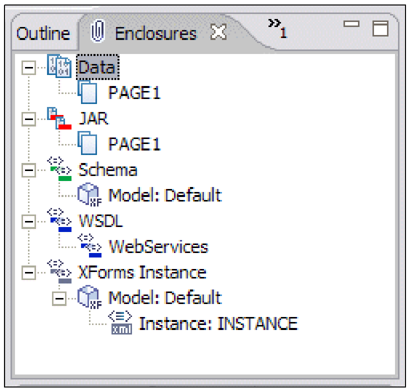


Figure 2-24 Enclosures view

The type of enclosures are listed in Table 2-5.

Table 2-5 Enclosure types

Type	Details
Data	The Designer lets you specify which page of your form you can attach a file to. The Data option lets you select the appropriate page. Images or documents to be used with attachment features are added here. For detailed information about adding images, see “Adding an image file to a form” on page 263. For detailed information about attachments, see “Attachments” on page 260.
JAR	The Designer lets you enclose custom Java modules containing additional form functions. For information about how to develop your own Java modules (.jar files), see the Java API User's Manual.
Schema	The Designer lets you enclose a schema file in your form. You can then use the enclosed schema to create instances. You can also use an enclosed schema to validate the information in the model. The schema validates all data in the model in the target namespace for that schema.
WSDL	The Designer lets you enclose a Web Services Definition Language (WSDL) document to your form. Once enclosed, you can use the WSDL to generate an instance.
XForms Instances	The Designer lets you enclose an XML file that contains an XForms instance.

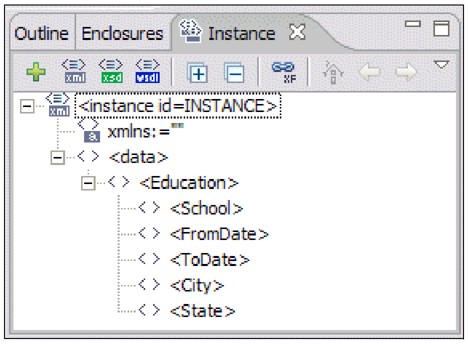
Advanced views

The following advanced views are available:

- Instance view
- XForms view
- XML Model view
- XML Model Instance view

Instance view

The Instance view is used to define the XML template for the data that will be collected from the form, as shown in Figure 2-25. A data instance can be used to store input values, pre-populate fields with data, or generate list selections.



```
<instance id=INSTANCE>
    xmlns:=""
  <data>
    <Education>
      <School>
      <FromDate>
      <ToDate>
      <City>
      <State>
```

Figure 2-25 Instance view

XForms view

The XForms view is used to add XForms support and to manage XForms Models. See Figure 2-26.

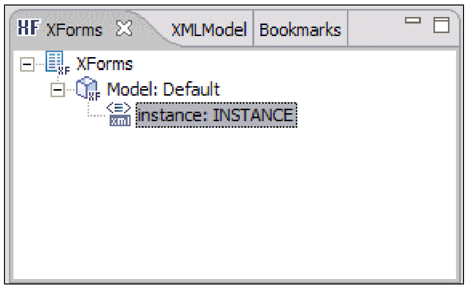


Figure 2-26 XForms view

Once you create an XForms Model, you can use the XForms view to add, edit, or delete the XForms elements such as XForms Models, instances, submissions, binds, and schemas.

XML Model view

You use the XML Model view to create and manage an XML model. See Figure 2-27.

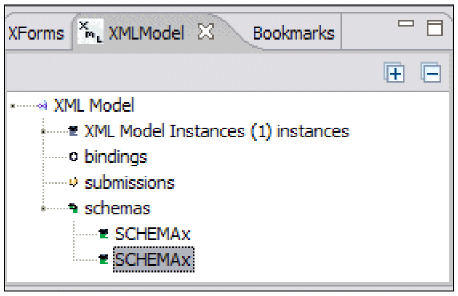


Figure 2-27 XML Model view

Note: The XML Model view is not part of the Designer perspective.

XML Model Instance view

The XML Model Instance view provides a listing of the XML data instances used in your form.

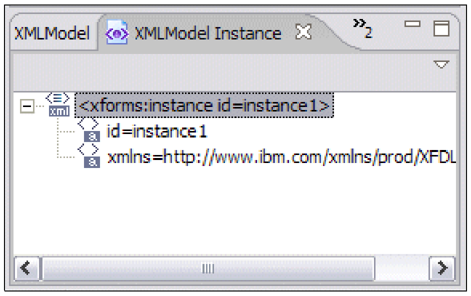

XMLModel
XMLModel Instance
<xforms:instance id=instance1>
id=instance1
xmlns=http://www.ibm.com/xmlns/prod/XFDL

Figure 2-28 XML Model Instance view

Note: The XML Model Instance view is not part of the Designer perspective.

2.4 Form Design basics

In this section we create a new form using a blank canvas to introduce you to some of the most used design functions. The following topics are covered:

- Create a new form.
- Add items.
- XForms support.
- Define item properties.
- Layout form items.

2.4.1 Create a new form

To introduce you to the Designer we create a simple one-page form used to collect employee information. This exercise is provided to introduce you to as many features of the new Designer as is practical. We will start with a blank XFDL form, add some XFDL items, and later add XForms support.

To create the form, expand your Navigator view and then locate a Project folder where you would like to store this form. Right-click the folder and in the pop-up window select **New** → **New Workplace Form**.

At the next pop-up window, provide a name for your form. We named ours BlankForm, as shown in Figure 2-29. Notice that the parent folder name is already defined.

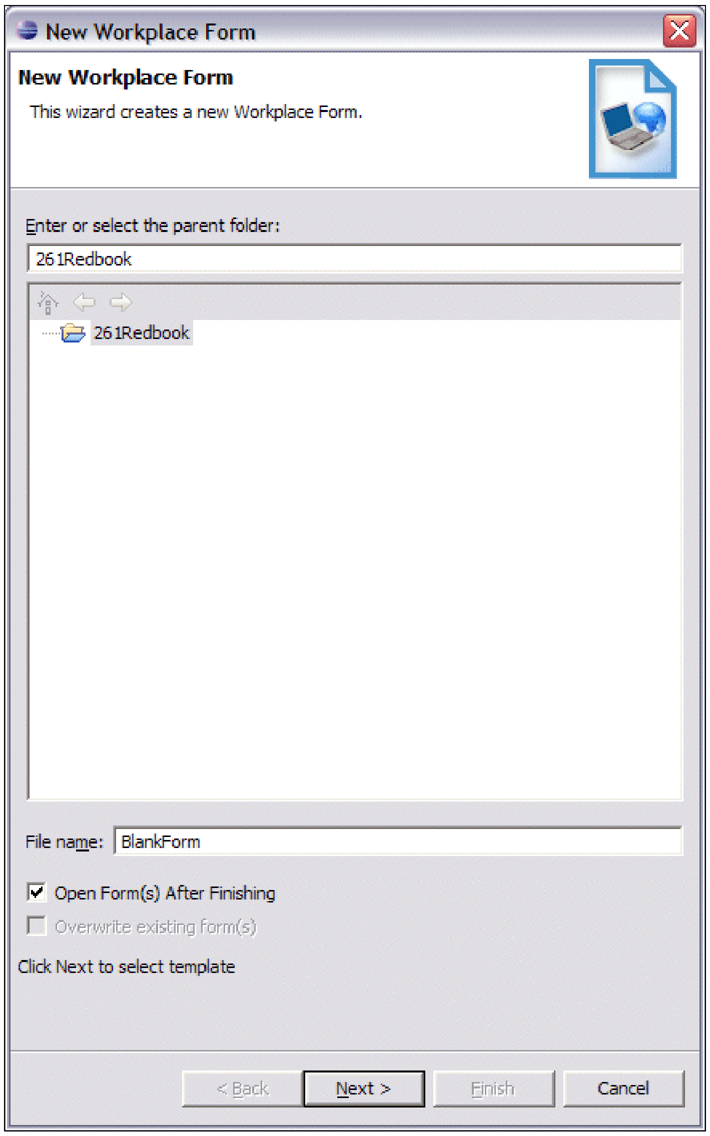
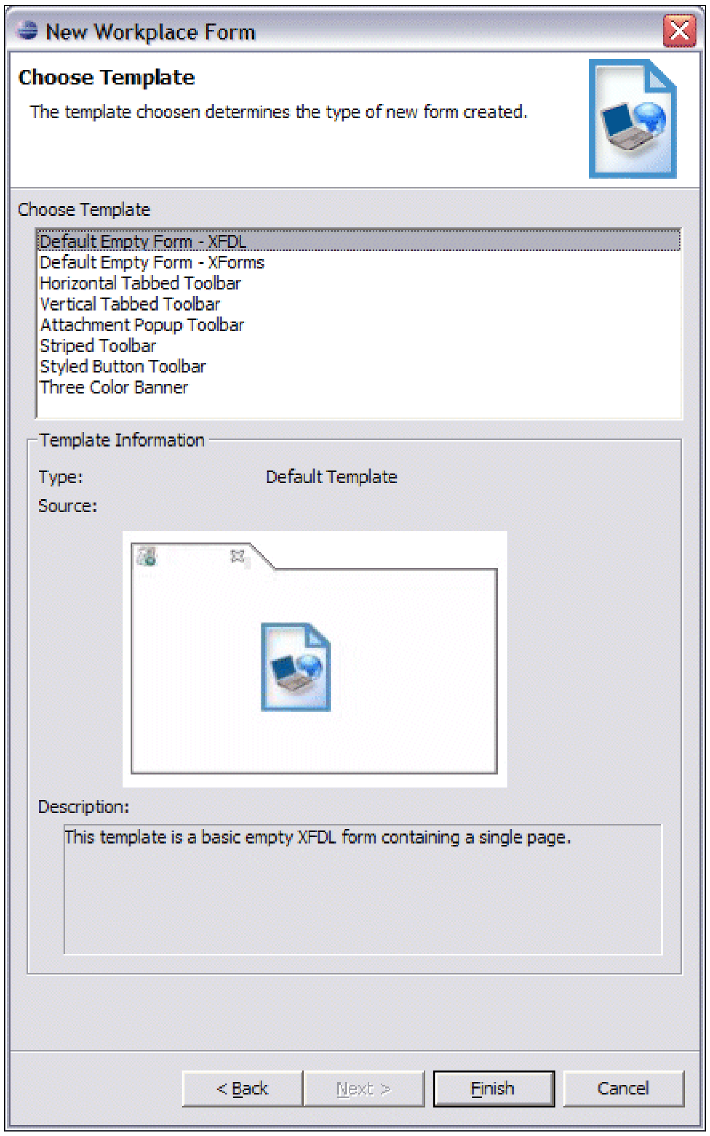

New Workplace Form
New Workplace Form
This wizard creates a new Workplace Form.
Enter or select the parent folder:
261Redbook
261Redbook
File name: BlankForm
☑ Open Form(s) After Finishing
☐ Overwrite existing form(s)
Click Next to select template
< Back
Next >
Finish
Cancel

Figure 2-29 Form name

At this point we use a blank XFDL form as our template, so accept the default template, and click **Finish**, as shown in Figure 2-30.



Choose Template

The template choosen determines the type of new form created.

Choose Template

- Default Empty Form - XFDL
- Default Empty Form - XForms
- Horizontal Tabbed Toolbar
- Vertical Tabbed Toolbar
- Attachment Popup Toolbar
- Striped Toolbar
- Styled Button Toolbar
- Three Color Banner

Template Information

Type: Default Template

Source:

Description:

This template is a basic empty XFDL form containing a single page.

Figure 2-30 Blank XFDL template

An Empty page will be loaded, as shown in Figure 2-31.

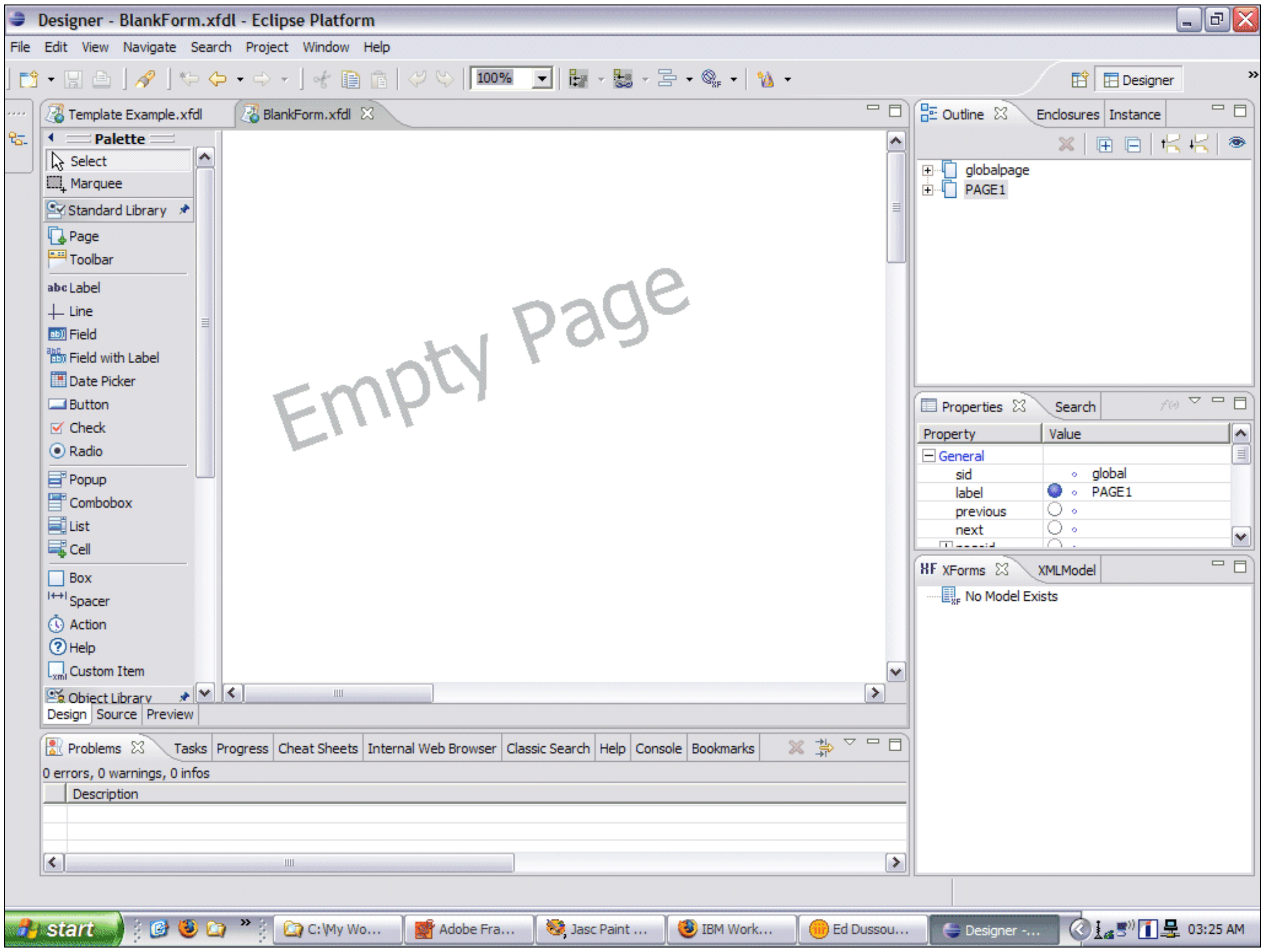


Figure 2-31 Empty XFDL Form page

Notice: The workspace shown in Figure 2-31 has been customized to meet the needs of our Developer. The palette has been moved to the left, the Navigation view has been changed to a *fast view*, and several other views have been rearranged based on most frequent use.

Layout tools

Before we start to build our form, we want to add layout tools. The Designer interface provides a number of tools to help you in precisely designing items:

- Rulers

  Horizontal and vertical rulers that measure in pixels or inches. You can choose whichever units you prefer. Rulers are useful for creating a clean, symmetrical layout for your form.

- Grids

  A grid of uniformly placed dots that are super-imposed on the form to assist you in item placement. You can adjust the spacing of the grid to either pixels or inches. Additionally, the *snap-to-grid* feature automatically aligns the top left corner of items to the nearest point on the grid. This grid helps you line up items on the form and ensure uniform spacing.

- Guides

  Horizontal and vertical lines that you can place throughout the form to ensure that items line up. The top or left side of items placed in the guide automatically *snap* into alignment along the guide. Guides are useful for creating a clean, symmetrical layout for your form.

Add rulers and grids go to the designers Menu bar and select XML Model. Place a check box next to the following items on the View pop-up list: Show Rulers, Show Grids, Snap to Grid, and Show Page Size. The resulting changes will appear in your design canvas, as shown in Figure 2-32.

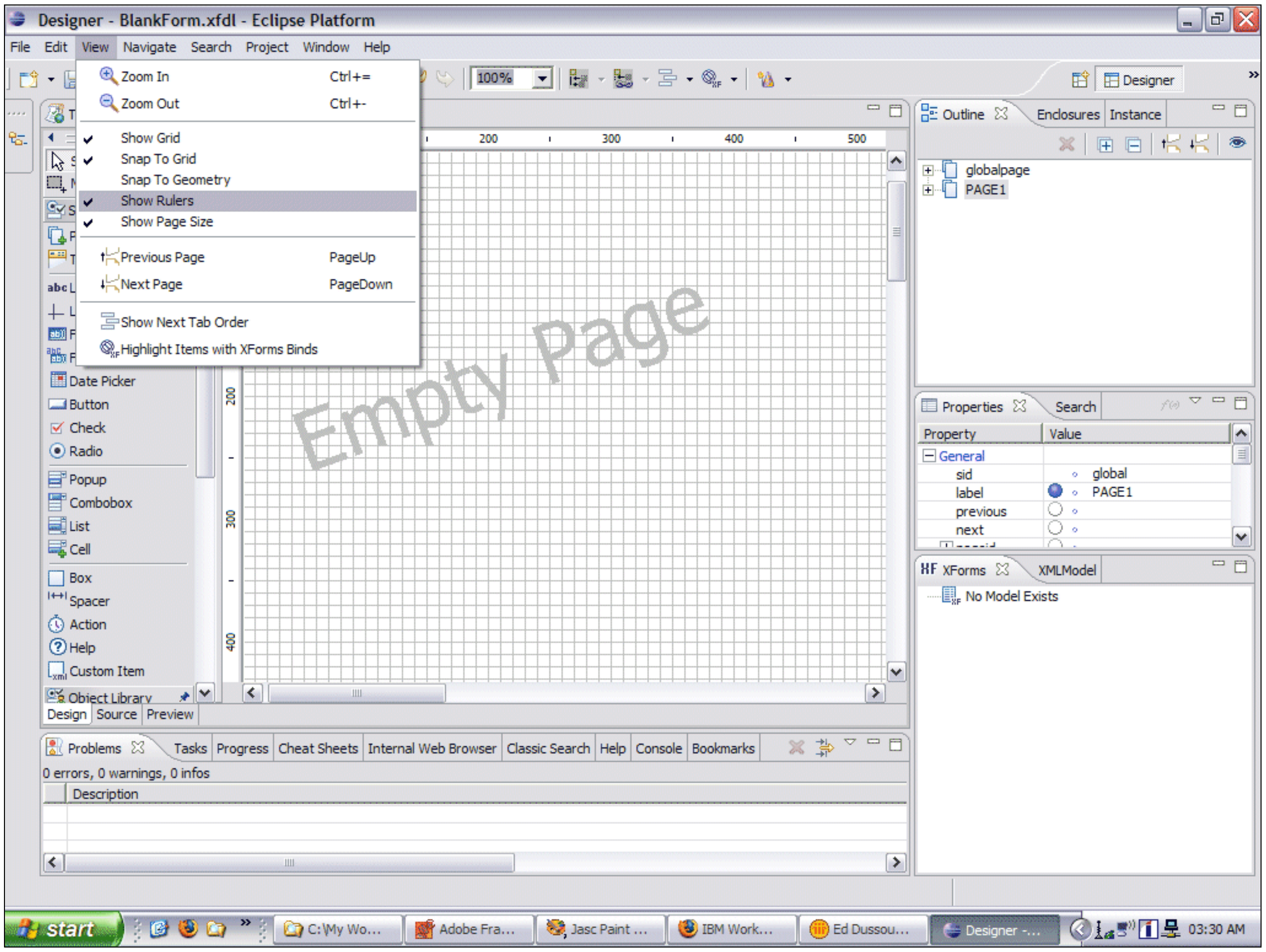
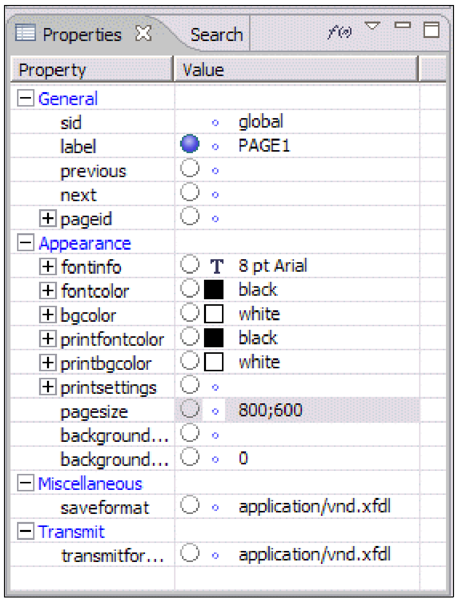


Figure 2-32 Layout tools

To add guidelines simply click in the ruler areas where you would like your guidelines to appear. We placed them at 50 for both the horizontal and vertical. If you do not get them exactly right you can slide them to the desired position, or just slide them down to zero to remove them.

The next thing we want to do for our form is to define a page size. Page size is normally determined by one or two factors. Sometimes form page size is dictated by the size of the original form, such as the U.S. standard 8.5 X 11. But if you do not need to represent the original form entirely on one e-form page, then it is best to use a more e-friendly size that will allow you to render the entire page on one screen. The still common SVGA (Super VGA) screen resolution of 800x600 pixels is often the best choice. This low resolution setting allows all users to see the entire page without scrolling regardless of the capabilities of video graphics adapter.

Set the page size go to the Properties view for the page, and set the page size attribute to 800;600, as shown in Figure 2-33.

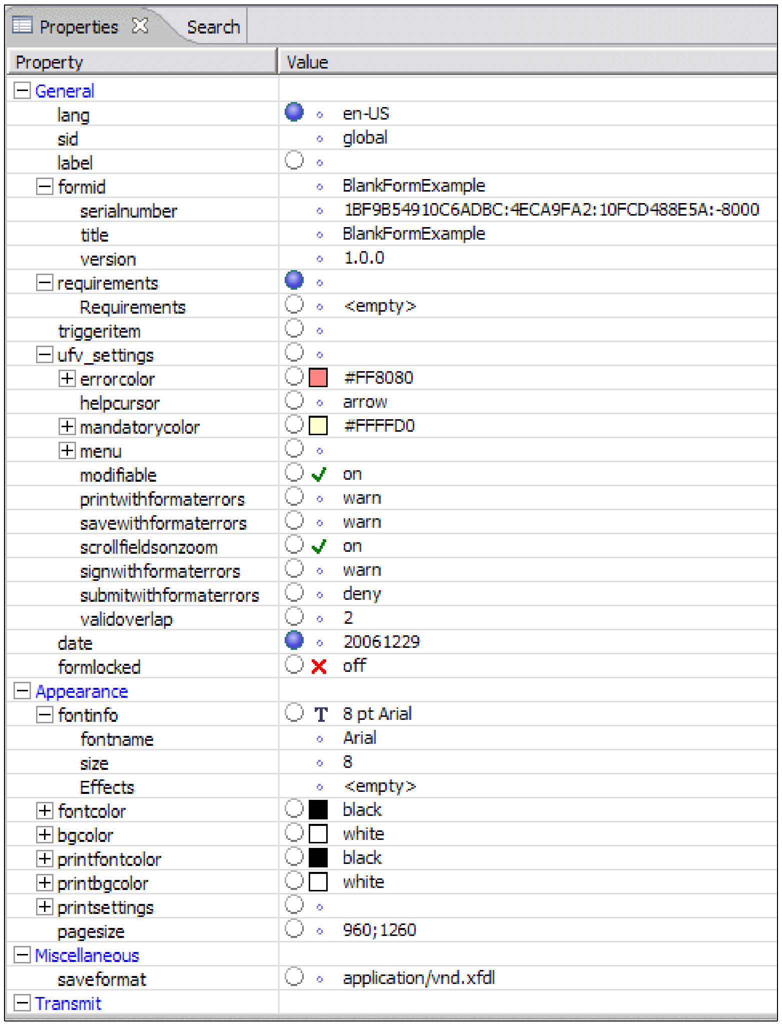


Property		Value
General		
sid		global
label	●	PAGE1
previous	○	
next	○	
pageid	○	
Appearance		
fontinfo	○	8 pt Arial
fontcolor	○ ■	black
bgcolor	○ □	white
printfontcolor	○ ■	black
printbgcolor	○ □	white
printsettings	○	
pagesize	○	800;600
background...	○	
background...	○	0
Miscellaneous		
saveformat	○	application/vnd.xfdl
Transmit		
transmitfor...	○	application/vnd.xfdl

Figure 2-33 Set page size

The last thing to consider before the addition of items to your form are Global page properties. Defining properties for the Global page of a form will allow the following pages to inherit those properties. For instance, the default font for a form is 8pt Arial, but if you know the form needs to use 9pt Times New Roman for all user interactions, then changing it here can be a major time saver. Also, should you need to change the properties later for an individual form item, or even page, you can just by changing the properties for that item or page.

To modify the Global Page properties, go to the Global Page through the form Outline, or just press the PgUp key while your form canvas has focus. Then double-click the Properties view tab to maximize your view, as shown in Figure 2-34.



Property	Value
General	
lang	en-US
sid	global
label	
formid	BlankFormExample
serialnumber	1BF9B54910C6ADBC:4ECA9FA2:10FCD488E5A:-8000
title	BlankFormExample
version	1.0.0
requirements	
Requirements	<empty>
triggeritem	
ufv_settings	
errorcolor	#FF8080
helpcursor	arrow
mandatorycolor	#FFFFD0
menu	
modifiable	✓ on
printwithformaterrors	warn
savewithformaterrors	warn
scrollfieldsonzoom	✓ on
signwithformaterrors	warn
submitwithformaterrors	deny
validoverlap	2
date	20061229
formlocked	✗ off
Appearance	
fontinfo	T 8 pt Arial
fontname	Arial
size	8
Effects	<empty>
fontcolor	black
bgcolor	white
printfontcolor	black
printbgcolor	white
printsettings	
pagesize	960;1260
Miscellaneous	
saveformat	application/vnd.xfdl
Transmit	

Figure 2-34 Global Page properties

As examples we changed the errorcolor to red, the mandatorycolor to yellow, and the font to 9 pt Times New Roman. When finished making your changes, return to page 1 by pressing the PgDn key. In the next section we add items to the form.

2.4.2 Add items

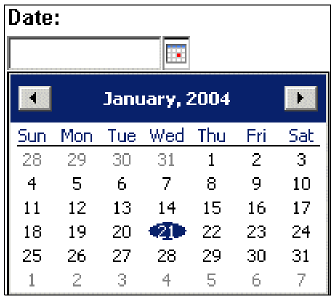
The global settings are complete. We can begin to build our form by adding items. We start with an item from the Standard XFDL library.

In this section we show how to add a standard item, and an item from the object library.

- Standard items
- Object library

Standard items

Date picker calendars let the user type a date into a field or use the calendar to select a date, as shown in Figure 2-35. In either case, the date is displayed in the format of your choice.

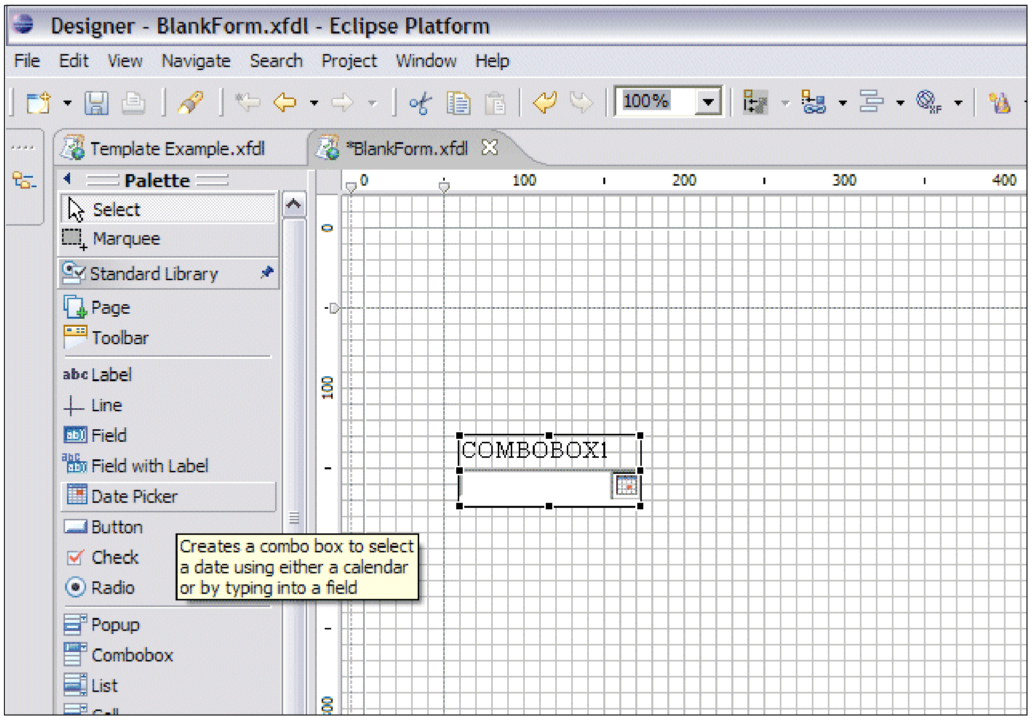


Sun	Mon	Tue	Wed	Thu	Fri	Sat
28	29	30	31	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31
1	2	3	4	5	6	7

Figure 2-35 Date picker

To create a calendar:

1. In the palette, click **Date Picker**.
2. Click the canvas to insert the calendar, as shown in Figure 2-36.



Creates a combo box to select a date using either a calendar or by typing into a field

Figure 2-36 Date picker added to form from palette

We modify the properties for this item later. At this state we focus solely on adding items to the form and planning our layout. Click the **Preview** tab located in the lower left-hand corner of your design canvas. The viewer will launch inside the workspace. The date picker is fully functional with a calendar widget. Return to the Design canvas by clicking the **Design** tab in the lower left-hand corner.

Object library

The object library contains predefined items and groups of items available for reuse in your form design. As an example lets us add a *US Address Block* to the form from the palette's object library. See Figure 2-37.

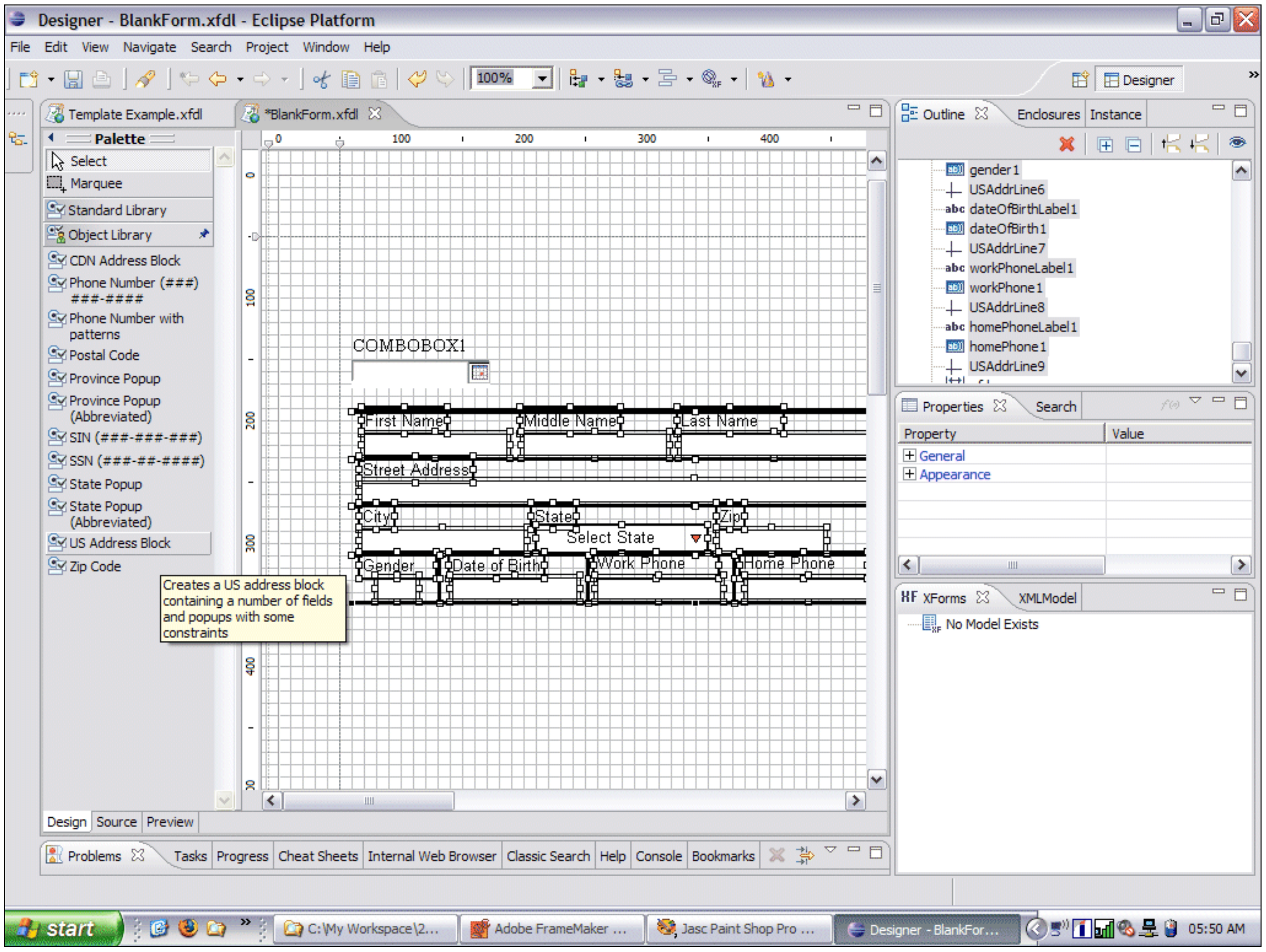


Figure 2-37 Add US Address Block to form

Notice that it adds all of the standard information normally needed when requesting a a person's address and contact information. If you need to customize this block all you need do is add or remove items, or modify properties to meet your needs.

Click the **Preview** tab in the lower left-hand corner of your design canvas. All of the formatting is there as well. Phone number fields require the appropriate format. The state combobox has a list of all fifty states. Also, the First Name, Last Name, and Social Security Number fields are all mandatory. Return to the Design canvas by clicking the **Design** tab in the lower-left hand corner.

2.4.3 XForms support

For our employee information form we would also like to capture educational history. It will require the addition of the following fields: institution name, dates attended (from/to), city, and state. We could create a static table with three rows and five columns, but that may not provide enough rows for every employee, or too many for another. We need something more dynamic, and with the new XForms items we have a quick solution.

By adding XForms support to our form, we can build a XForms Model with a data instance to represent the elements for educational history. Then we can use a wizard to create a dynamic table in our form. This table will allow the addition and removal of rows as needed by the user when the form is launched in the viewer.

In this section we complete the following steps:

1. Add XForms support.
2. Create an instance.
3. Create table.

Add XForms support

The first thing we need to do is add XForms support to our form. In the XForms view right-click the **No XForms** label and select **Add Xforms Support**, as shown in Figure 2-38.

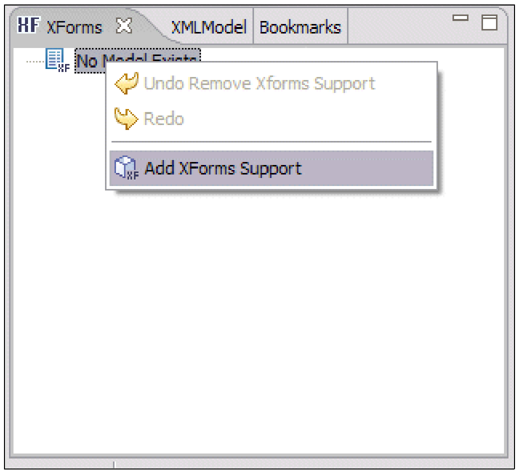


Figure 2-38 Add XForms support

By adding XForms support to the form a default model has been created, and a number of new XForms items have been added to our design palette. See Figure 2-39.

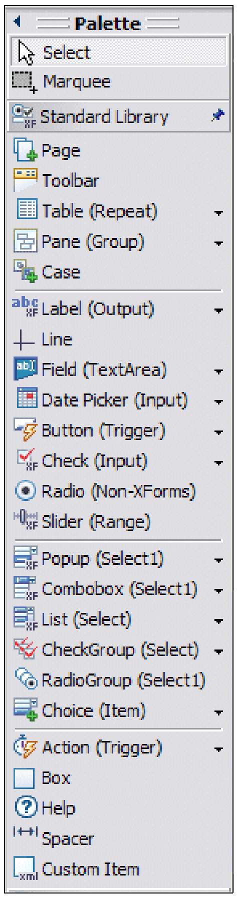


Figure 2-39 XForms palette

XForms items

An XForms item is an XFDL-wrapped user interface (UI) item that you can bind to a node in the data model or trigger an action based on how the user interacts with the form.

The method you use to add an XForms item to a page is identical to adding an XFDL item. On the palette you click an XForms item and then click the canvas where you want to place the item.

Since the XForms item is wrapped in XFDL, you can use all the XFDL properties (such as itemlocation and appearance) to alter and customize the XForms item as desired.

Take a minute to look over the new items in our palette. Several of the items now have their own subset of items. For example, there are now four types of field items:

- Field (input)
- Field (TextArea)
- Field (Secret)
- Field (non-XForms)

Create an instance

Every XForms Model must contain an instance. To add an instance to the model, right-click the default model and select **Add Instance**, as shown in Figure 2-40.

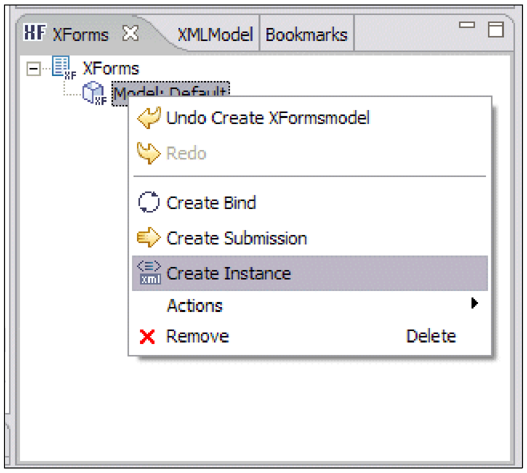


Figure 2-40 Create instance

We can now build our instance. In the Instance view, right-click the default element named **data** and select **Add Element**, as shown in Figure 2-41.

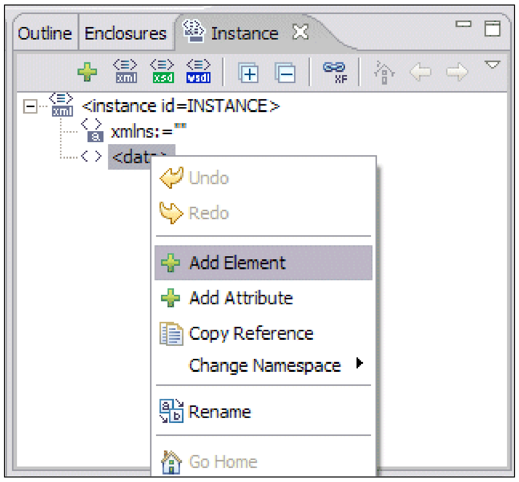


Figure 2-41 Add parent element

A new child element will be created and named <data1> by default. To minimize the potential for confusion it is a good practice to be as specific as possible when naming elements. While this new element is highlighted, go to the Properties view and rename its name attribute from data1 to Education.

Add five more elements to the education node to represent the educational data we require for our new table. By default these items will be named Education1, Education2, Education 3, Education4, and Education 5. Rename each of these items to specifically represent the columns we need. Use the order shown below:

1. School
2. FromDate
3. ToDate
4. City
5. State

When finished, the completed XForms Model instance should look exactly as shown in Figure 2-42.

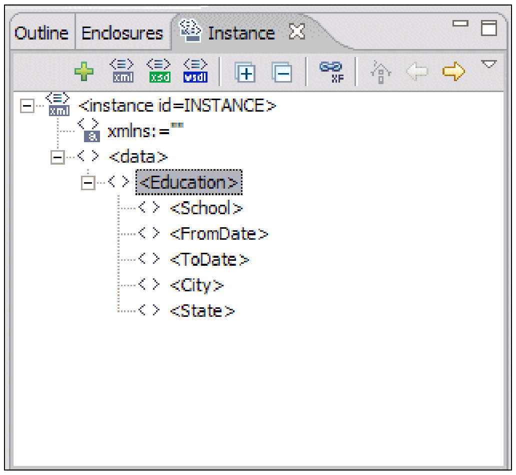


Figure 2-42 Add child data elements

Now that our XForms Model is complete let us look at the code view to see how it is represented in the source (Example 2-6).

Example 2-6 XForms Model code

```
<xformsmodels>
   <xforms:model>
      <xforms:instance id="INSTANCE" xmlns="">
         <data>
            <Education>
               <School></School>
               <FromDate></FromDate>
               <ToDate></ToDate>
               <City></City>
               <State></State>
            </Education>
         </data>
      </xforms:instance>
   </xforms:model>
</xformsmodels>
```

Create table

Now we have a model with a well-defined instance that represents our data values. We can build our table using a wizard. In the palette, select **Table (Repeat) by Wizard**, and place it on your form canvas, as shown in Figure 2-43.

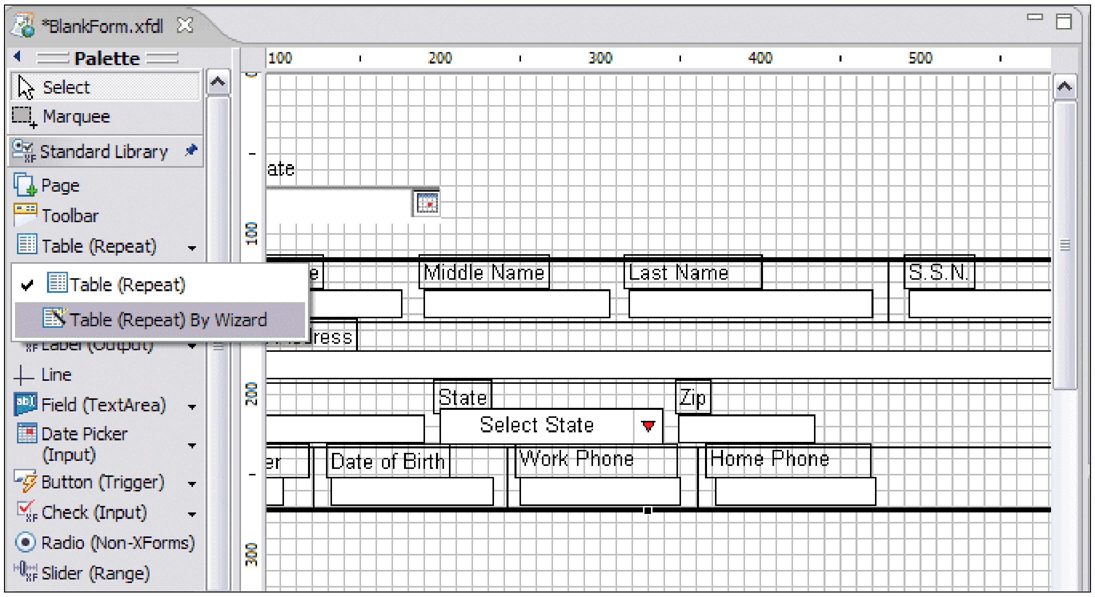
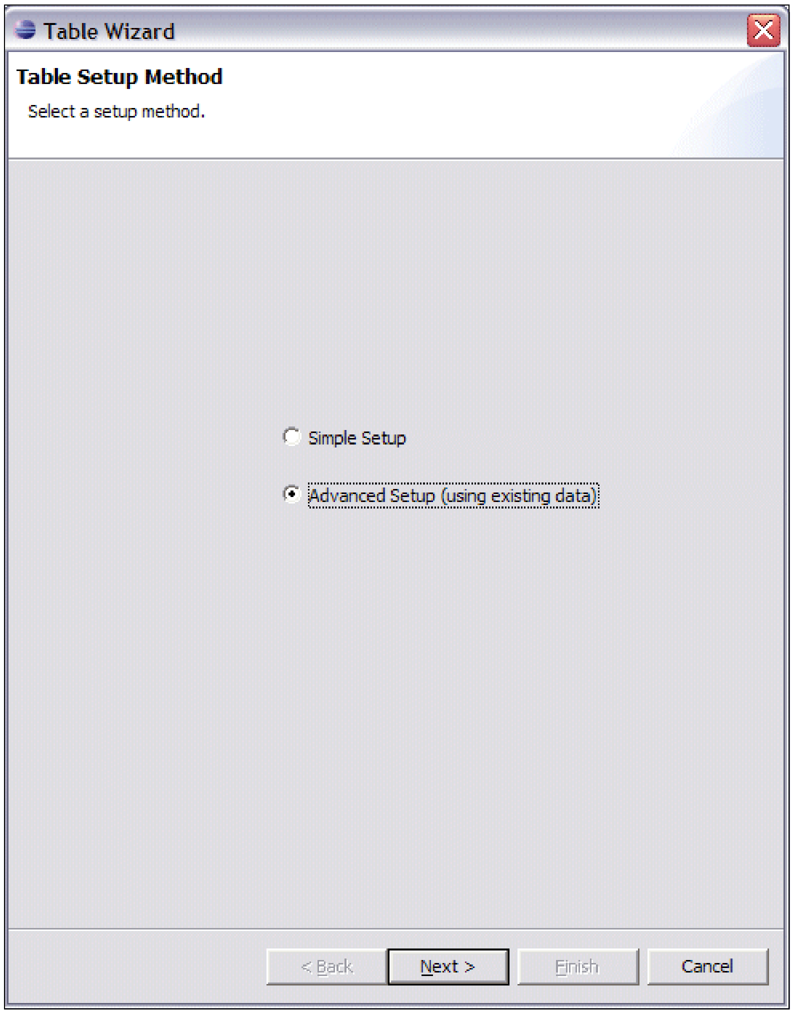


Figure 2-43   Add Table (Repeat) by Wizard

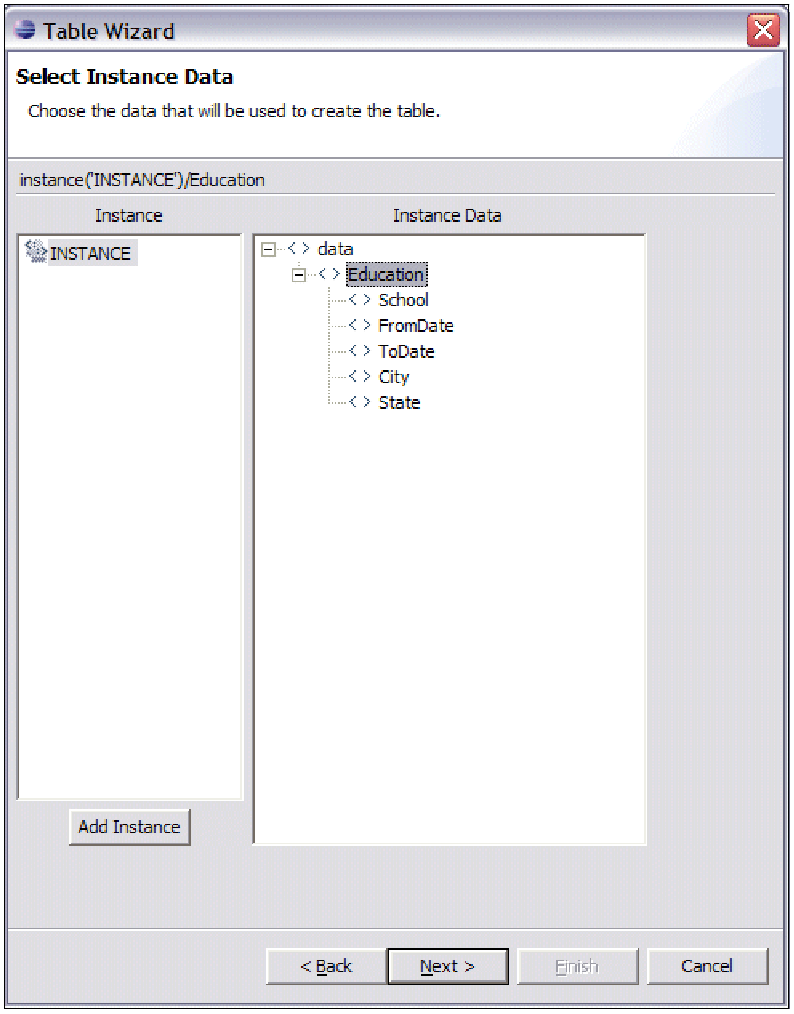
Select **Advanced Setup**, as shown in Figure 2-44.



Simple Setup [✓ Advanced Setup (using existing data)]

Figure 2-44 Select Advanced Setup

Select the **Education** node of the instance, as shown in Figure 2-45.



instance('INSTANCE')/Education

INSTANCE

```
data
  Education
    School
    FromDate
    ToDate
    City
    State
```

Figure 2-45 Select instance data

Configure columns as shown in Figure 2-46. Be sure to rename FromDate to `From` and ToDate to `To`.

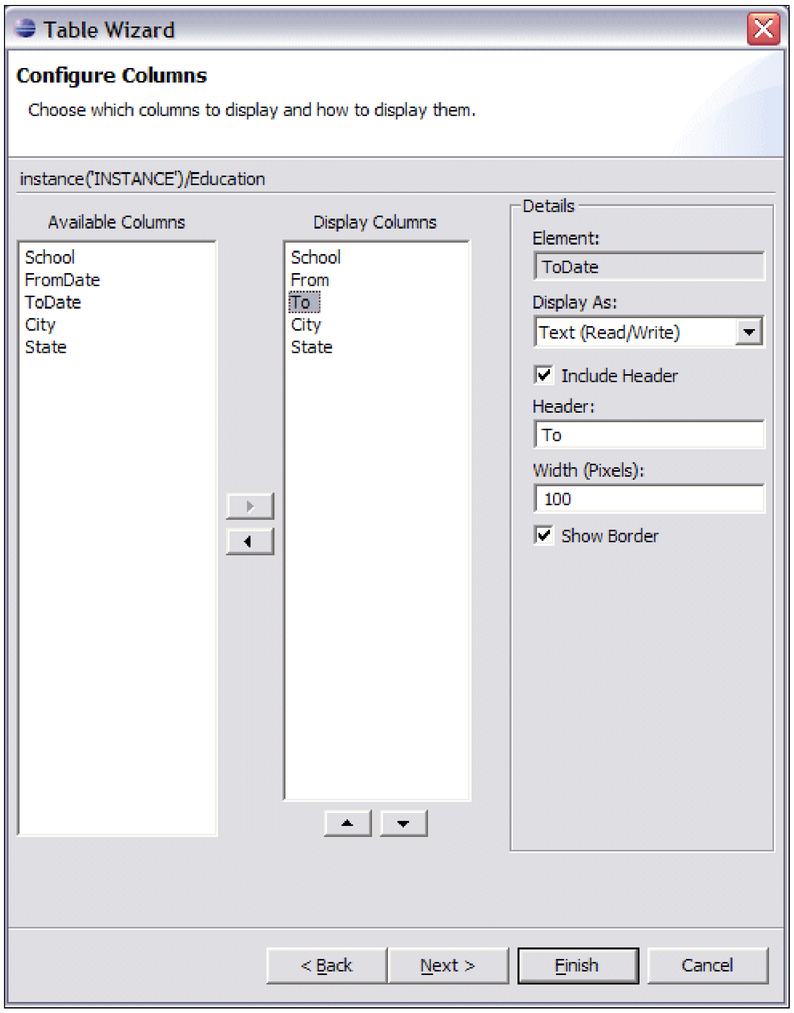


Table Wizard

Configure Columns

Choose which columns to display and how to display them.

instance('INSTANCE')/Education

Available Columns: School, FromDate, ToDate, City, State

Display Columns: School, From, To, City, State

Details

Element: ToDate

Display As: Text (Read/Write)

☑ Include Header

Header: To

Width (Pixels): 100

☑ Show Border

Figure 2-46 Configure Columns panel

Click **Next** on the Final Wizard page, rename your table, select the option to **Color Alternate Rows**, and select the option to **Highlight Row when Selected**, as shown in Figure 2-47.

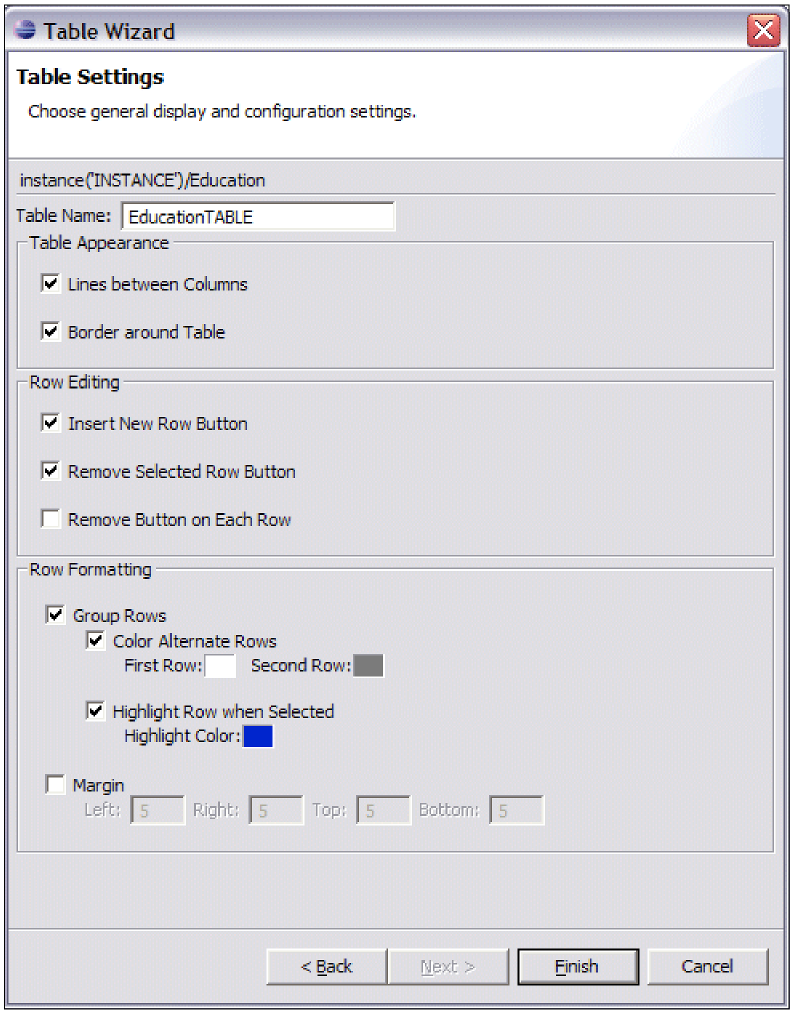


Table Wizard

Table Settings

Choose general display and configuration settings.

instance('INSTANCE')/Education

Table Name: EducationTABLE

Table Appearance

[✓] Lines between Columns

[✓] Border around Table

Row Editing

[✓] Insert New Row Button

[✓] Remove Selected Row Button

[ ] Remove Button on Each Row

Row Formatting

[✓] Group Rows

[✓] Color Alternate Rows

First Row: ⬜ Second Row: ⬛

[✓] Highlight Row when Selected

Highlight Color: 🟦

[ ] Margin

Left: 5 Right: 5 Top: 5 Bottom: 5

Figure 2-47 Table Settings panel

After navigating a few short menus, the wizard has created a fully functional dynamic table using the variables provided via the wizard interface. If you highlight the XForms pane and go to the source you can see the extensive code that has been generated. In just minutes over 200 lines of working code have been created with computes and calculations — all of which is tied to a XForms Model data instance. See Figure 2-48.

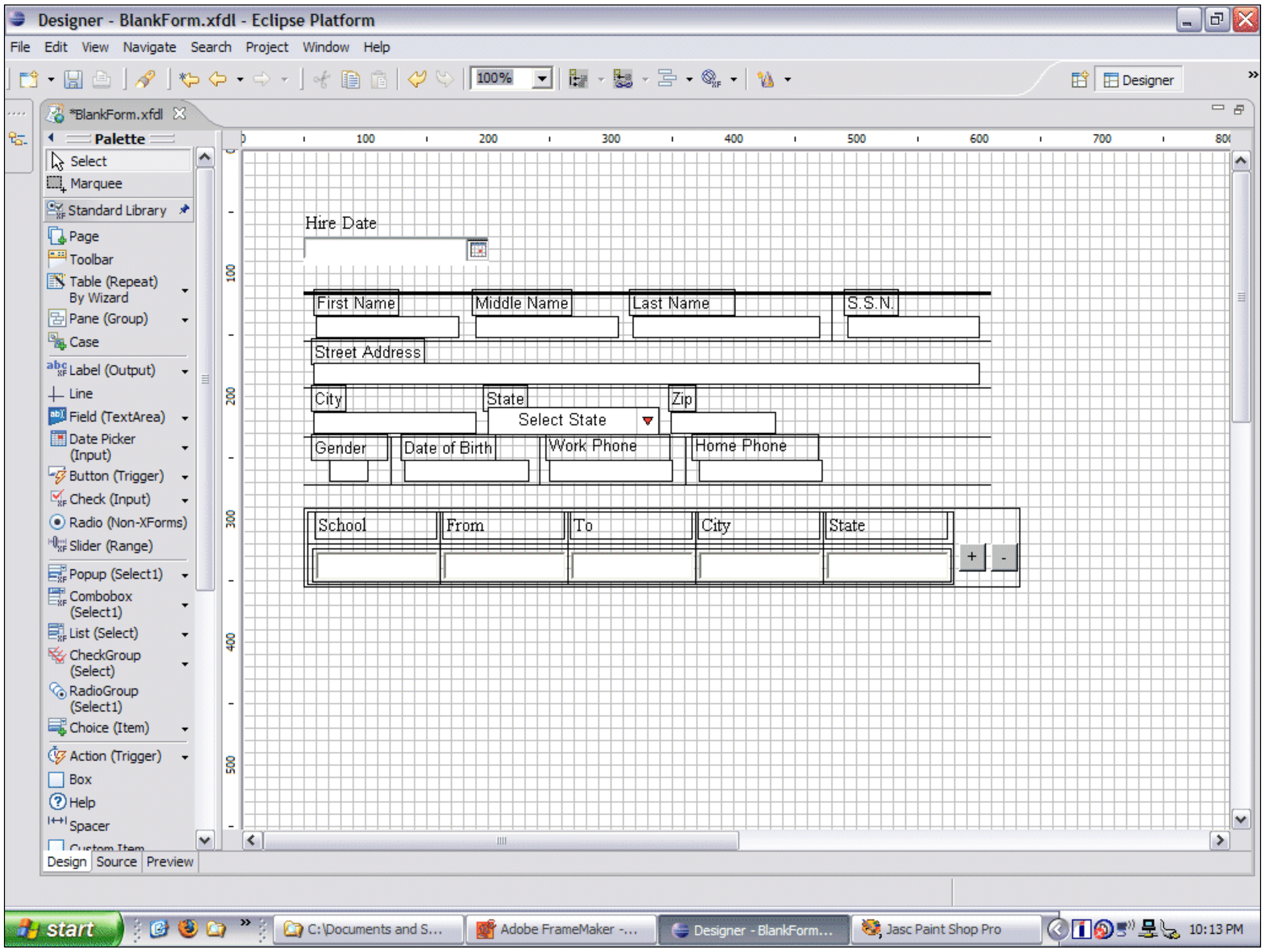
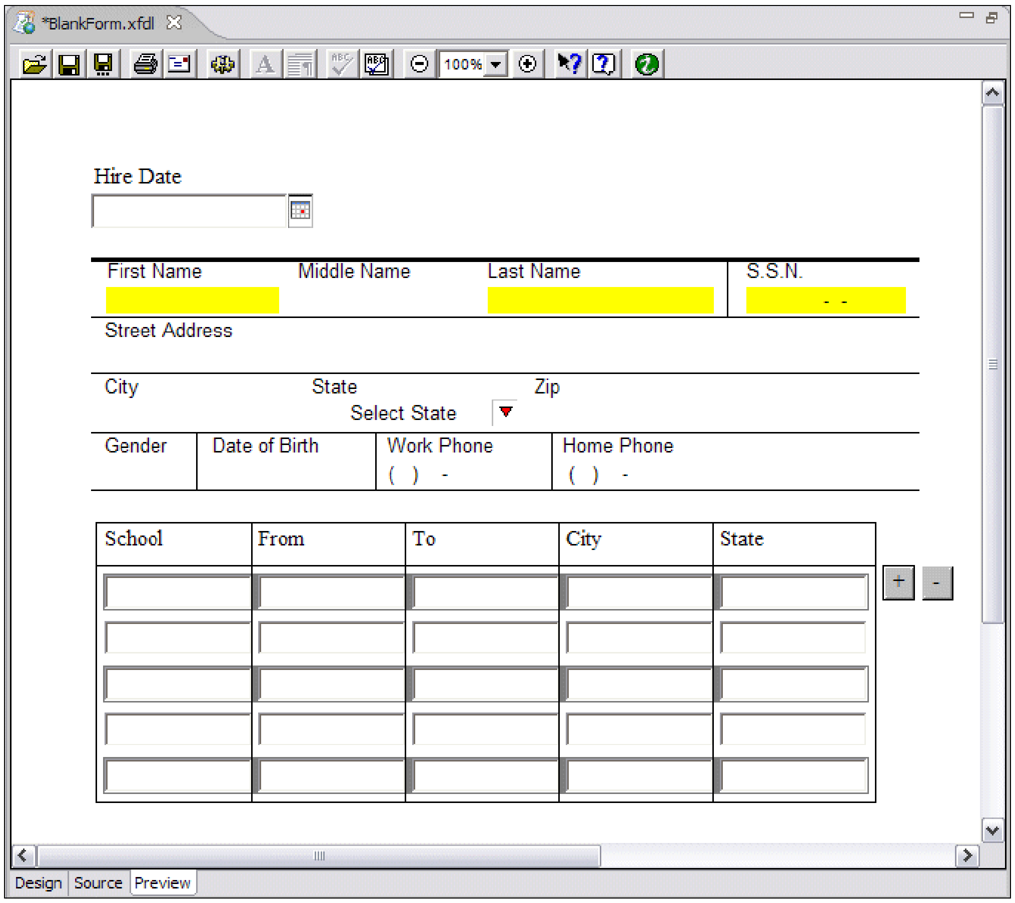


Figure 2-48 Table added to form

Click the **Preview** button to examine the new table. Be sure to click the action buttons to add and remove rows, as shown in Figure 2-49.



Hire Date

First Name	Middle Name	Last Name	S.S.N.
			- -

Street Address

City | State: Select State | Zip

Gender	Date of Birth	Work Phone	Home Phone
		( ) -	( ) -

School	From	To	City	State

Figure 2-49 Preview form

2.4.4 Define item properties

Item properties can dictate presentation and function of for items. In this section we introduce you to item properties and cover the following topics:

- Overview
- Set properties

Overview

Each item in your form has various properties that control its appearance and behavior (for example, the font of a text label, the action triggered by a button, and so on). By setting item properties, you can control the appearance and behavior of items.

Note: What is referred to as a property in the Designer, is referred to as an option in XFDL.

You can change these properties and give items new properties via the Properties view. The Properties view has several sections, which we list in Table 2-6.

Table 2-6 Properties view

Property section	Description
XForms (Item type)	Only available for XForms items. Aside from having XFDL item properties such as a sid, itemlocation, and appearance properties, the XForms item also has a set of XForms properties. It is the XForms properties that define how the XForms item interacts with the form's data layer. The contents of this section are variable, depending on the type of XForms item added to the form. Typically, it includes at least one reference (XPath) to a specific element of the XForms Model instance.
General Properties	Sets general characteristics for items. The contents of this section vary, depending on the type of item you are configuring. Typically, it includes any text the item displays, the size setting, toggles for making the item active or inactive, and any specialized information specific to the type of item you have selected.
Appearance Properties	Allows you to modify an item's appearance, such as color, visibility, and borders. If you want an item to display an image, you can use the Image section to insert an image into buttons and labels. Sets the style of the text displayed by an item, such as font type, size, and weight.
Format Properties	Sets how users input information into your form, and how that information is displayed. You can determine data types, set constraints on user input, and set predefined formats in this section.
Help Properties	Lets you create context-sensitive help for each visible item on a page. When users turn on help mode, help messages appear when the mouse pointer passes over an item with a help message. Allows you to add accessibility messages for users with visual disabilities.
Miscellaneous	Only available when advanced properties are shown. Allows for the definition or edits to custom attributes and/or options.
Signature	Only available when working with a button item. You must select **Show Advanced Properties** to display signature properties. Signature-specific attributes are defined here such as signature type, image, options, filters, and many more.
Transmit	Only available when working with a button item. You must select **Show Advanced Properties** to display transmit properties. Transmit-specific attributes include type, filters, references, format, and many others.

Attention: For detailed information about all properties, see the Workplace Forms XFDL Specification document:

http://www-128.ibm.com/developerworks/workplace/documentation/forms/#5

Or see Appendix B of the Designer User Guide:

http://publib.boulder.ibm.com/infocenter/wf/v2r6m1/index.jsp?topic=/com.ibm.help.wf.doc/i_wfd_t_setting_item_properties.html

There are advanced properties that can be very useful when creating forms. To show these items click the down arrow located in the top right corner of the header for the Properties view, and select **Show Advanced Properties**. Refer to Figure 2-50.

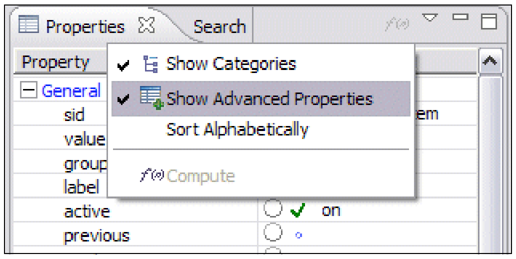
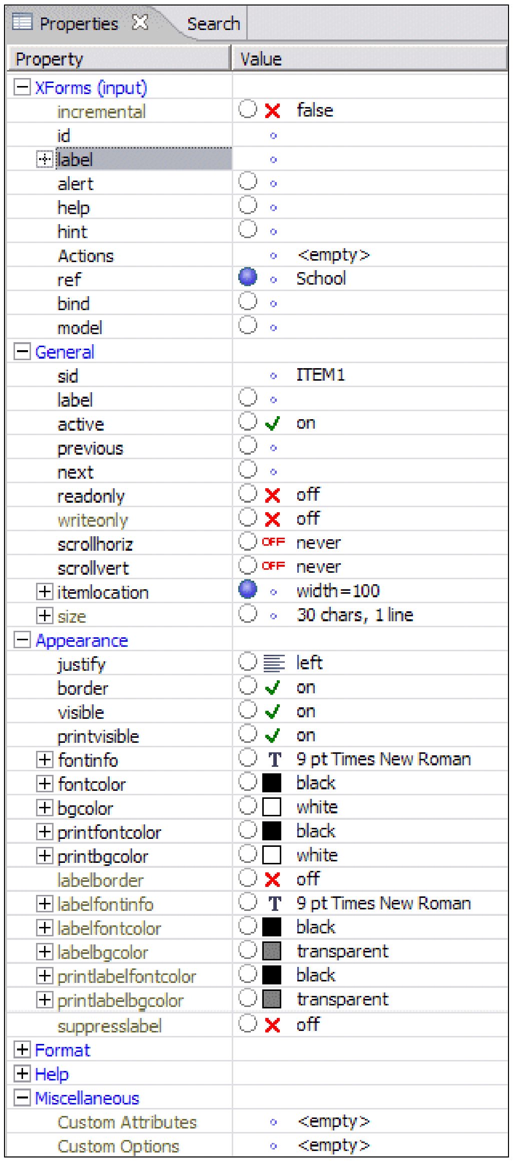


Figure 2-50 Show Advanced Properties

Let us look at the properties view for an XForms (Input) item. In Figure 2-51 we can see the first level of each section, as described above in Table 2-6 on page 71.



Property	Value
⊟ XForms (input)	
incremental	✗ false
id	
⊞ label	
alert	
help	
hint	
Actions	<empty>
ref	School
bind	
model	
⊟ General	
sid	ITEM1
label	
active	✓ on
previous	
next	
readonly	✗ off
writeonly	✗ off
scrollhoriz	OFF never
scrollvert	OFF never
⊞ itemlocation	width=100
⊞ size	30 chars, 1 line
⊟ Appearance	
justify	left
border	✓ on
visible	✓ on
printvisible	✓ on
⊞ fontinfo	T 9 pt Times New Roman
⊞ fontcolor	■ black
⊞ bgcolor	□ white
⊞ printfontcolor	■ black
⊞ printbgcolor	□ white
labelborder	✗ off
⊞ labelfontinfo	T 9 pt Times New Roman
⊞ labelfontcolor	■ black
⊞ labelbgcolor	▨ transparent
⊞ printlabelfontcolor	■ black
⊞ printlabelbgcolor	▨ transparent
suppresslabel	✗ off
⊞ Format	
⊞ Help	
⊟ Miscellaneous	
Custom Attributes	<empty>
Custom Options	<empty>

Figure 2-51 XForms Item Advanced Properties view

Set properties

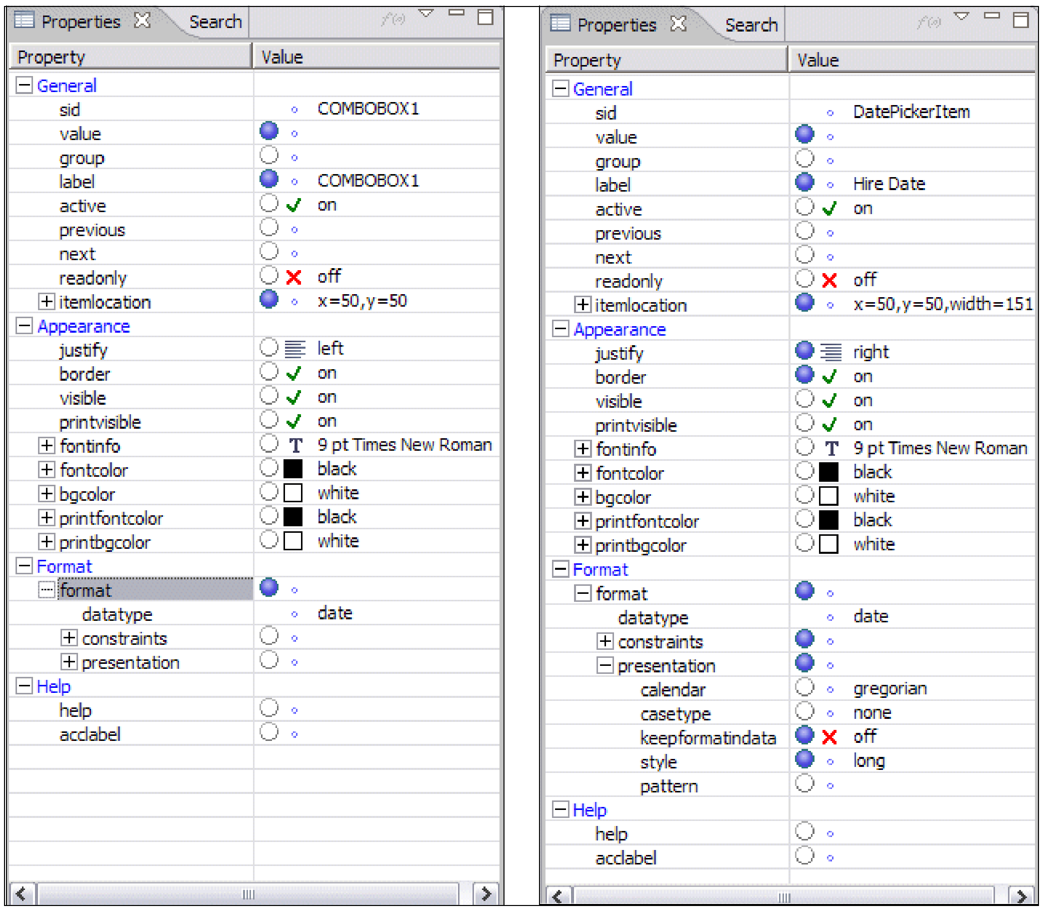
To set item properties:

1. Select the item.

> **Tip:** Press and hold the Shift key to select several items on the design canvas and set their common properties to the same values.

2. In the Properties view, click within the field of the property that you want to set.
3. Do either of the following:
   – For properties that accept text, type the value directly within the field or click the ellipse button (...) within the field to open a text editor.
   – For properties that accept one of several choices (for example, on/off or left/right/center), click the down arrow button within the field and select the setting.
   – For other properties (for example, fontinfo or fontcolor) click the ellipse button (...) within the field to open the editor for that type of property (for example, a font selection window or a color selection window).

Figure 2-52 shows the default properties on the left for the Data picker item we added to our canvas. Then on the right it shows some changes that we have made.



Property	Value
⊟ General	
sid	COMBOBOX1
value	●
group	○
label	● COMBOBOX1
active	○ ✓ on
previous	○
next	○
readonly	○ ✗ off
⊞ itemlocation	● x=50,y=50
⊟ Appearance	
justify	○ left
border	○ ✓ on
visible	○ ✓ on
printvisible	○ ✓ on
⊞ fontinfo	○ T 9 pt Times New Roman
⊞ fontcolor	○ ■ black
⊞ bgcolor	○ □ white
⊞ printfontcolor	○ ■ black
⊞ printbgcolor	○ □ white
⊟ Format	
⊟ format	●
datatype	date
⊞ constraints	○
⊞ presentation	○
⊟ Help	
help	○
acclabel	○

Property	Value
⊟ General	
sid	DatePickerItem
value	●
group	○
label	● Hire Date
active	○ ✓ on
previous	○
next	○
readonly	○ ✗ off
⊞ itemlocation	● x=50,y=50,width=151
⊟ Appearance	
justify	● right
border	● ✓ on
visible	○ ✓ on
printvisible	○ ✓ on
⊞ fontinfo	○ T 9 pt Times New Roman
⊞ fontcolor	○ ■ black
⊞ bgcolor	○ □ white
⊞ printfontcolor	○ ■ black
⊞ printbgcolor	○ □ white
⊟ Format	
⊟ format	●
datatype	date
⊞ constraints	●
⊟ presentation	●
calendar	○ gregorian
casetype	○ none
keepformatindata	● ✗ off
style	● long
pattern	○
⊟ Help	
help	○
acclabel	○

Figure 2-52 Properties view

Make the following changes:

- In the general section set:
  - sid = “DatePickerItem”
  - label = “*Hire Date*”
- In the appearance section set:

  justify =“*right*”
- In the format section, go the presentation sub section, and set:

  style = “*long*”

Preview the form to see the changes. When finished return to the Design canvas.

2.4.5 Layout form items

There are many tools that can help you position and arrange items on a page. We covered rules, grids, and guides in “Layout tools” on page 54. In this section we focus on the topics listed below, paying close attention to the differences between relative and absolute methods.

- Basic layout
- Aligning items
- Expanding items
- Apply alignment rules

Basic layout

In this section we discuss the basic layout.

Build order of items

When you insert items onto a page, the order in which they are created plays an important part in how you can position them. As you place items on the page, they form a sequence. The first item you place on the page is the first item in the sequence, the second item you place is the second item in the sequence, and so on. This sequence is called the build order, since it is the order in which you build the form. The build order seldom reflects the order in which the items actually appear on the form, since the items can be moved anywhere once they have been created.

When you use relative positioning, you must be aware of this build order. If you position an item, any item that you use as a reference must precede the item you place in the build order. For example, if you created a label, then a field, and then a button, you would be able to position the button in relation to either the field or the label. However, you would not be able to position the label in relation to either of the other items, because those items come after it in the build order.

The build order of items on a page is the same as the order in which the items are listed in the Outline view, as shown in Figure 2-53.

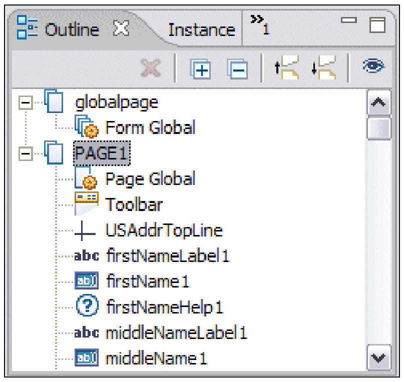


Figure 2-53 Outline view

Selecting items

To select an item, click it. A bounding box displays around the item, indicating that you selected it. Alternatively, click the item name in the Outline view.

To select multiple items do one of the following:

- Hold down the Ctrl key and click each item.
- To select individual items in a group, use the Marquee tool in the palette. Hold down the left mouse button and drag the pointer diagonally on the form to surround the items.
- To select all of the items on the form at once, click **Edit** → **Select All**, or press the Ctrl+a key combination.

Moving items

To move an item do any of the following:

- Select the item and drag it. If you want the item to move in one direction only (vertically, horizontally, or diagonally), hold down the Shift key while you drag it.
- To nudge an item by 1 pixel at a time, select the item and press an arrow key.
- To nudge an item by the grid spacing, select the item, hold down the Ctrl key, and press an arrow key.
- In the Properties view, expand **General**, **itemlocation**, **Location List**, and set the x and y values.

To undo a move, click **Edit** → **Undo Move Object**.

Resizing items

To resize an item:

1. Select the item.
2. Do one of the following:
   - Click and drag its edges.
   - In the Properties view, expand **General**, **itemlocation**, and **Location List**, and set the new values for x and y.

– Nudge or resize items by 1 pixel at a time.

i. Press the period key on your keyboard. The cursor changes to a two-way arrow on a side of the item.

ii. Move from one edge to another by pressing the period key on your keyboard.

iii. Once you have selected a side to resize, use the arrow keys on your keyboard to nudge the size of the item in 1 pixel increments.

iv. Press Enter to accept the new size of the item.

Aligning items

You can align items so that their edges or centers are lined up. There are two types of align:

- Relative align: changes the position of items so that they align with another item (the reference item) and anchors the items to the reference item. If you later move or resize the reference item, any items anchored to it will automatically move in order to maintain alignment with the reference item.
- Absolute align: changes the position of items so that they align with another item (the reference item). The items will not automatically move if you later move or resize the reference item.

Use relative align when the size or position of items on your form may vary (for example, when your form is receiving data from a database or when sections of your form are created dynamically).

Important: Be selective when using relative alignment. While absolute position and expansion values are not recorded, relative position and expansion values are recorded in the *itemlocation* properties and will remain as part of the item's properties even if copied or cut, and pasted on another page or location in the form. If the reference item does not exist, then the alignment may fail and will likely need to be updated or removed.

To remove relative positioning settings assigned to an item:

1. Select the item you have applied relative positioning to.
2. In the Properties view, expand **General**, **itemlocation** and **Location List**. X and Y properties are listed as well as the assigned relative alignment choices. For example, if you choose **Relative Align Below**, the alignment type Below is listed under Location List.
3. In the value field adjacent to the alignment property, click **An image of a delete**. The alignment assignment is deleted.

Alignment types

You can align items by using the alignment types described in Table 2-7.

Table 2-7 Alignment types

Type	Description
Above	Moves the items above the reference item (leaving three pixels between each item) and aligns their left edges
After	Moves the items to the right of the reference item (leaving three pixels between each item) and aligns their top edges
Before	Moves the items to the left of the reference item (leaving three pixels between each item) and aligns their top edges

Type	Description
Below	Moves the items below the reference item (leaving three pixels between each item) and aligns their top edges
Top to Bottom	Moves the items so their top edges align with the bottom edge of the reference item
Top to Center	Moves the items so their top edges align with the center of the reference item
Top to Top	Moves the items so their top edges align with the top edge of the reference item
Left to Center	Moves the items so their left edges align with the center of the reference item
Left to Left	Moves the items so their left edges align with the left edge of the reference item
Left to Right	Moves the items so their left edges align with the right edge of the reference item
Right to Center	Moves the items so their right edges align with the center of the reference item
Right to Left	Moves the items so their right edges align with the left edge of the reference item
Right to Right	Moves the items so their right edges align with the right edge of the reference item
Bottom to Bottom	Moves the items so their bottom edges align with the bottom edge of the reference item
Bottom to Center	Moves the items so their bottom edges align with the center of the reference item
Bottom to Top	Moves the items so their bottom edges align with the top edge of the reference item
Center to Bottom	Moves the items so their centers align with the bottom edge of the reference item
Center to Left	Moves the items so their centers align with the left edge of the reference item
Center to Right	Moves the items so their centers align with the right edge of the reference item
Center to Top	Moves the items so their centers align with the top edge of the reference item
Horizontally Between	Moves the reference item horizontally so it is spaced equally between two other items on the form
Center to Center	Horizontally moves the items horizontally so their centers align with the center of the reference item
Vertically Between	Moves the reference item vertically so it is spaced equally between two other items on the form
Center to Center	Vertically moves the items vertically so their centers align with the center of the reference item

Important: If you expand items using relative alignment, the reference item must be before the aligned items within the build order.

The build order is shown in the Outline view. If necessary, you can change the build order by dragging and dropping a form item from one location to another with in the Outline view.

To align items

To align items:

1. Select the items to move.

2. Select the reference item (that is, the item that will not move and that the other items will align to). If you align items using relative align, the reference item must be before the aligned items within the build order.
3. Right-click and select an alignment type from Absolute Expand or Relative Expand.

Tip: Because relative positioning relies on using other items as points of reference, you will often need to include invisible points of reference in order to put space between your items or position your items exactly where you want them. You can use spacers to create these invisible points of reference and to create space between items on your form.

To use spacers as invisible reference points for relative positioning:

1. In the palette, click **Spacer**.
2. Click the page.
3. Place another item on the page.
4. Hold the Shift key down and select a spacer to use as an reference.
5. Right-click and select **Relative Align**.
6. Select the modifier to position the spacer item.
7. Click **Preview**. Once the form is open, notice that the spacer is invisible.

Expanding items

You can simultaneously resize and align items by expanding them. This is a quick way to resize items so that they line up with other items exactly. For example, you can expand a label to the size of a field by using a right-to-right expansion. This will lengthen the label until it is the same size as the field and align the right edge of the label with the right edge of the field.

There are two types of expand:

- Relative expand: changes the size of items so that they align with another item (the reference item) and anchors the items to the reference item. If you later move or resize the reference item, any items anchored to it will automatically change size in order to maintain alignment with the reference item.
- Absolute expand: changes the size of items so that they align with another item (the reference item). The items will not automatically change size if you later move or resize the reference item.

Expansion types

You can simultaneously resize and align items using the expansion types listed in Table 2-8.

Table 2-8 Expansion types

Type	Description
Make Same Size	Resizes the items to the size of the reference item
Make Same Width	Resizes the width of the items to match the width of the reference item
Make Same Height	Expands/contracts the height of the items to the height of the reference item
Top to Bottom	Expands/contracts the top edge of the items to the bottom edge of the reference item
Top to Center	Expands/contracts the top edge of the items to the center of the reference item

Type	Description
Top to Top	Expands/contracts the top edge of the items to the top edge of the reference item
Left to Center	Expands/contracts the left edge of the items to the center of the reference item
Left to Left	Expands/contracts the left edge of the items to the left edge of the reference item
Left to Right	Expands/contracts the left edge of the items to the right edge of the reference item
Right to Center	Expands/contracts the right edge of the items to the center of the reference item
Right to Left	Expands/contracts the right edge of the items to the left edge of the reference item
Right to Right	Expands/contracts the right edge of the items to the right edge of the reference item
Bottom to Bottom	Expands/contracts the bottom edge of the items to the bottom edge of the reference item
Bottom to Center	Expands/contracts the bottom edge of the items to the center of the reference item
Bottom to Top	Expands/contracts the bottom edge of the items to the top edge of the reference item

Important: If you expand items using relative expand, the reference item must be before the expanded items within the build order.

The build order is shown in the Outline view. If necessary, you can change the build order by dragging and dropping a form item from one location to another within the Outline view.

To expand items

To expand items:

1. Select the items to expand.
2. Select the reference item (that is, the item that the other items expand to).
3. Right-click and select an expansion type from Absolute Expand or Relative Expand.

You can use both absolute and relative positioning to set an item's position on a page.

Tip: Press and hold the Shift key to select several items on the design canvas to align, or expand them at the same time.

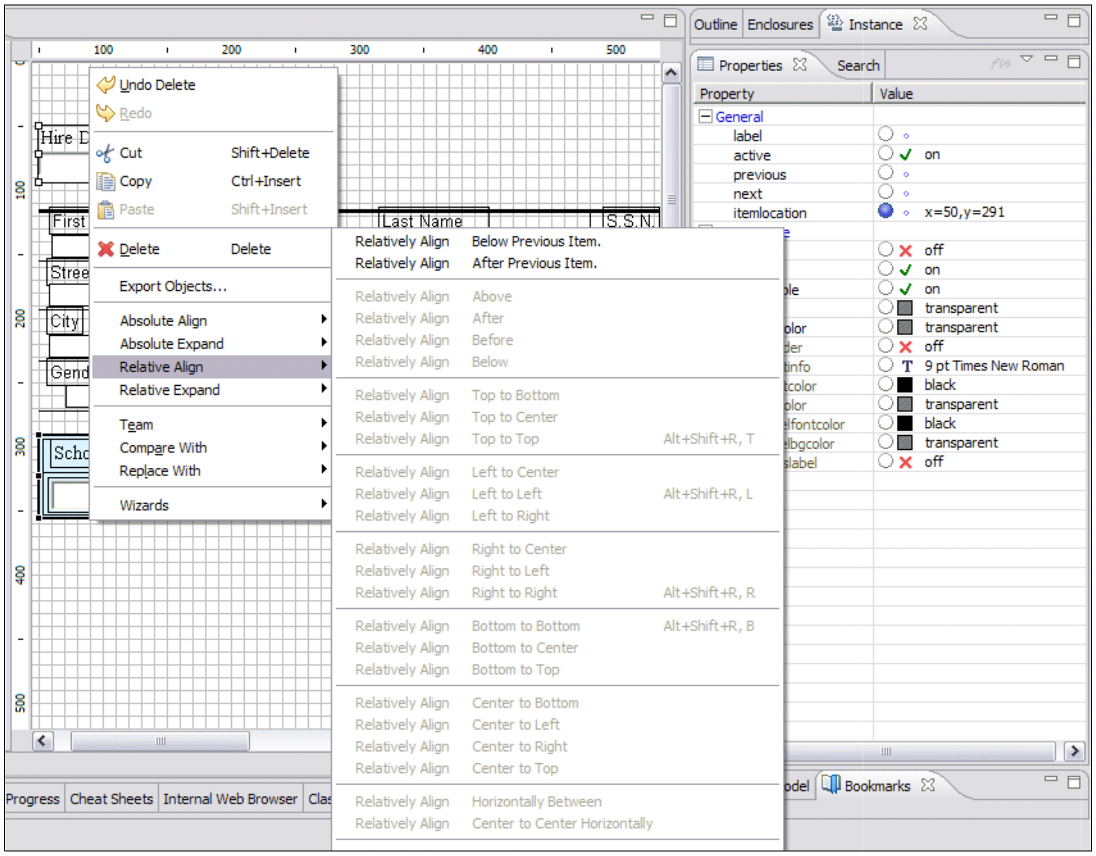
Apply alignment rules

Open the Employee Information Form in the Workplace Forms Designer. This illustrates alignment rules.

First, we relocate the Hire Date combobox below our XForms table. Since this table is dynamic and may expand or shrink, relative alignment is necessary. Follow these steps:

1. Locate the DatePickerItem on the design canvas.
2. Hold down the Ctrl key and click **DatePickerItem** first.
3. While still holding the Ctrl key, locate and right-click the **EDUCATIONTABLE_Pane** reference item.

4. Notice that Relative Align Below is not available, as shown in Figure 2-54.


Outline
Enclosures
Instance
Properties
Search
Undo Delete
Redo
Cut Shift+Delete
Copy Ctrl+Insert
Paste Shift+Insert
Delete Delete
Export Objects...
Absolute Align
Absolute Expand
Relative Align
Relative Expand
Team
Compare With
Replace With
Wizards
Relatively Align Below Previous Item.
Relatively Align After Previous Item.
Relatively Align Above
Relatively Align After
Relatively Align Before
Relatively Align Below
Relatively Align Top to Bottom
Relatively Align Top to Center
Relatively Align Top to Top Alt+Shift+R, T
Relatively Align Left to Center
Relatively Align Left to Left Alt+Shift+R, L
Relatively Align Left to Right
Relatively Align Right to Center
Relatively Align Right to Left
Relatively Align Right to Right Alt+Shift+R, R
Relatively Align Bottom to Bottom Alt+Shift+R, B
Relatively Align Bottom to Center
Relatively Align Bottom to Top
Relatively Align Center to Bottom
Relatively Align Center to Left
Relatively Align Center to Right
Relatively Align Center to Top
Relatively Align Horizontally Between
Relatively Align Center to Center Horizontally
Progress
Cheat Sheets
Internal Web Browser
Bookmarks

Property	Value
General	
label	
active	✓ on
previous	
next	
itemlocation	x=50,y=291
	✗ off
	✓ on
...le	✓ on
	transparent
...olor	transparent
...der	✗ off
...info	T 9 pt Times New Roman
...tcolor	black
...olor	transparent
...lfontcolor	black
...lbgcolor	transparent
...slabel	✗ off

Figure 2-54 Relative alignment options restricted

5. Remember that the reference item must be before the items to be aligned in the build order of this form page.
   a. To change the build order of this item:
      i. In the Outline view, select an **DatePickerItem** and drag it up or down in the list.
      ii. When the cursor is located just above the “vfd_spacer” item in the outline, release the mouse button.

b. When finished it should be positioned as shown in Figure 2-55.

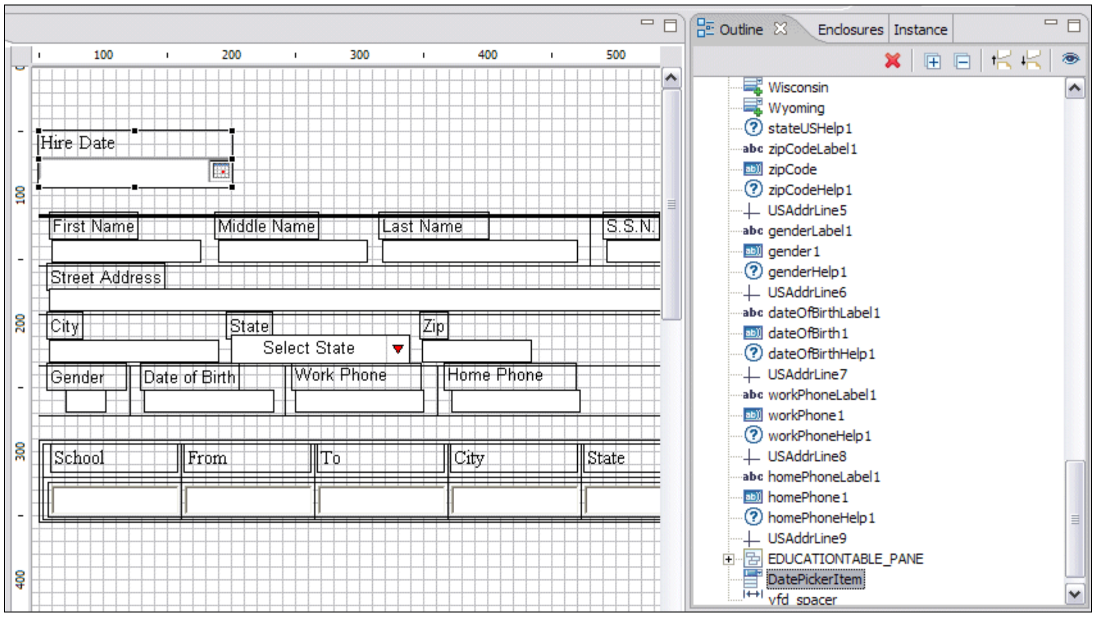


Figure 2-55 Modify build order

6. Now repeat steps 1–3 in this series. Notice, however, that this time the option to relative align the DatePickerItem below the pane is now available. Select it, as shown in Figure 2-56.

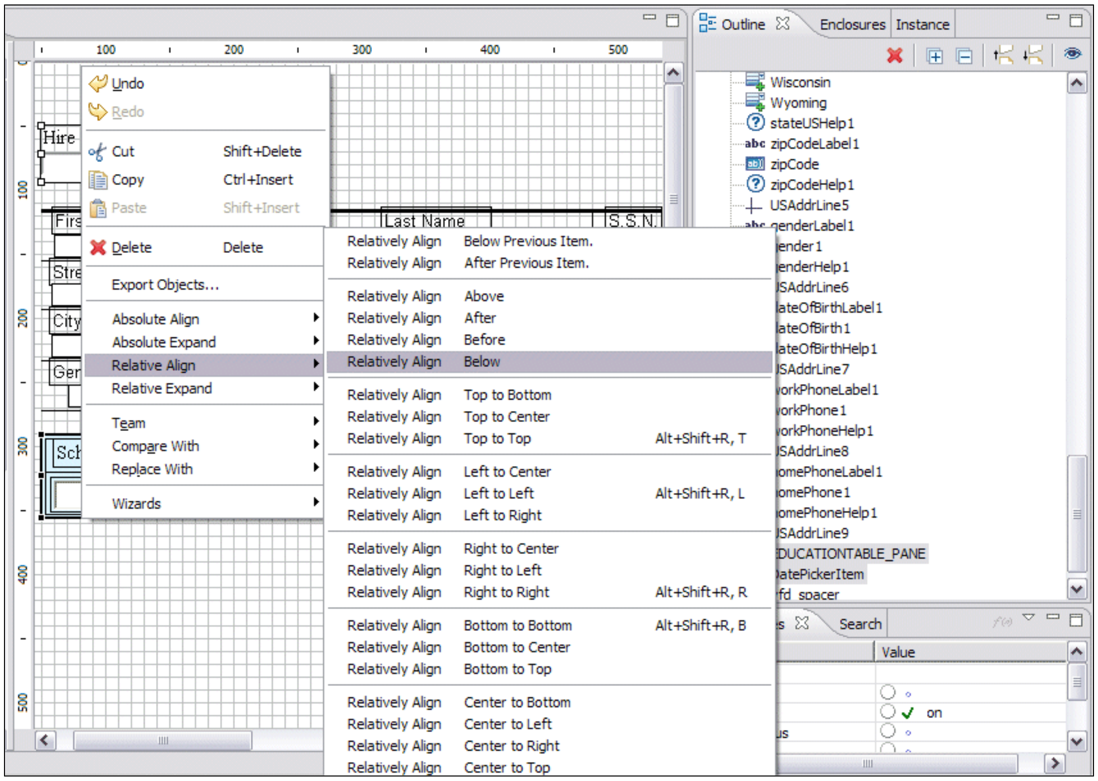

Undo
Redo
Cut Shift+Delete
Copy Ctrl+Insert
Paste Shift+Insert
Delete Delete
Export Objects...
Absolute Align
Absolute Expand
Relative Align
Relative Expand
Team
Compare With
Replace With
Wizards
Relatively Align Below Previous Item.
Relatively Align After Previous Item.
Relatively Align Above
Relatively Align After
Relatively Align Before
Relatively Align Below
Relatively Align Top to Bottom
Relatively Align Top to Center
Relatively Align Top to Top Alt+Shift+R, T
Relatively Align Left to Center
Relatively Align Left to Left Alt+Shift+R, L
Relatively Align Left to Right
Relatively Align Right to Center
Relatively Align Right to Left
Relatively Align Right to Right Alt+Shift+R, R
Relatively Align Bottom to Bottom Alt+Shift+R, B
Relatively Align Bottom to Center
Relatively Align Bottom to Top
Relatively Align Center to Bottom
Relatively Align Center to Left
Relatively Align Center to Right
Relatively Align Center to Top
Outline
Enclosures
Instance
Search
Value

Figure 2-56 Relative align below

Notice that the DatePickerItem has been place on the left side of the canvas, directly below the EDUCATIONTABLE_Pane. Preview the form. No matter how many rows that you may add or remove in our table, the hire date always remains exactly below the table. When we look at the code for this item, as shown in Example 2-7, we see that the relative position has been recorded in the item location properties.

Example 2-7 XFDL code for relative positioning of an item

```
<itemlocation>
   <width>151</width>
   <below>EDUCATIONTABLE_PANE</below>
</itemlocation>
```

Now let us position the EDUCATIONTABLE_Pane below the US Address Block. Since the address block object and all of its associated items were added before we created our XForms table, the build order is not an issue. Also, the address block is static, and relative alignment is not necessary. Absolute alignment is all we need. Lastly, this time we use the Outline view instead of the canvas to define our alignment.

1. In the Outline view locate the **EDUCATIONTABLE_Pane**, and click it.
2. Hold down the Shift key and click the item listed directly above it in the build order. If you have not deviated from the instructions it will be USAddrLine9. Both items should be highlighted.
3. Now right-click either item, and select **Absolute Align Below** from the list, as shown in Figure 2-57.

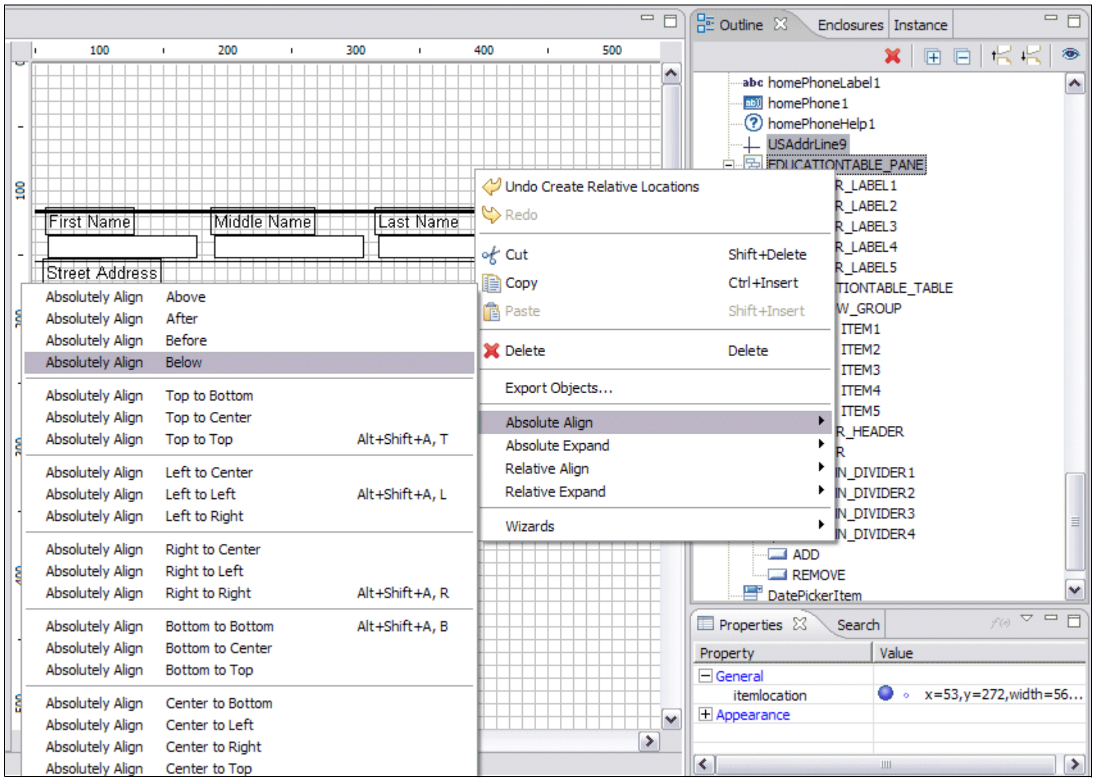

Outline
Enclosures
Instance
homePhoneLabel1
homePhone1
homePhoneHelp1
USAddrLine9
EDUCATIONTABLE_PANE
First Name
Middle Name
Last Name
Street Address
Undo Create Relative Locations
Redo
Cut Shift+Delete
Copy Ctrl+Insert
Paste Shift+Insert
Delete Delete
Export Objects...
Absolute Align
Absolute Expand
Relative Align
Relative Expand
Wizards
Absolutely Align Above
Absolutely Align After
Absolutely Align Before
Absolutely Align Below
Absolutely Align Top to Bottom
Absolutely Align Top to Center
Absolutely Align Top to Top Alt+Shift+A, T
Absolutely Align Left to Center
Absolutely Align Left to Left Alt+Shift+A, L
Absolutely Align Left to Right
Absolutely Align Right to Center
Absolutely Align Right to Left
Absolutely Align Right to Right Alt+Shift+A, R
Absolutely Align Bottom to Bottom Alt+Shift+A, B
Absolutely Align Bottom to Center
Absolutely Align Bottom to Top
Absolutely Align Center to Bottom
Absolutely Align Center to Left
Absolutely Align Center to Right
Absolutely Align Center to Top
ADD
REMOVE
DatePickerItem
Properties
Search
Property
Value
General
itemlocation
x=53,y=272,width=56...
Appearance

Figure 2-57 Absolute align below

Notice that the EDUCATIONTABLE_Pane has been placed on the left side of the canvas, directly below the USAddrLine9 item. Also notice that the DatePickerItem has maintained its position relative to the pane even though the pane has moved.

When we look at the code for this item, as shown in Example 2-8, we see that there is no reference to the alignment in the item location properties.

Example 2-8 XFDL code for absolute positioning of an item

```
<itemlocation>
   <width>100</width>
</itemlocation>
```

2.5 Add a toolbar

Toolbars allow you to place headings and control buttons on your forms so that they are always visible for users. Toolbars appear at the top of forms when they are opened in the Viewer, but when the form is printed, the toolbar is omitted, and can therefore be used for items that do not need to be printed, such as control buttons.

You can add a toolbar to any page of your form. This toolbar creates an area at the top of the page that will not scroll with the rest of the form, and will always be visible to the user. This is useful if you have a number of buttons that you always want the user to have access to, such as save or submit buttons, or if you have a title that you always want to be visible.

Tips on setting up your toolbar:

- Create a toolbar with all of the necessary buttons, images, and text that you need, then duplicate this toolbar to paste onto each of the additional pages.
- Make sure that your buttons are set up properly before you start working with them. Decide which buttons you will need, such as a print button, a save button, a submit button, and so on. Then use one button as the basis for aligning all of the others relative to one another on the form.

In this section we cover:

- Adding a toolbar to a page
- Adding items to a toolbar

2.5.1 Adding a toolbar to a page

To add a toolbar to the current page:

1. In the palette, click **Toolbar**, as shown in Figure 2-58.

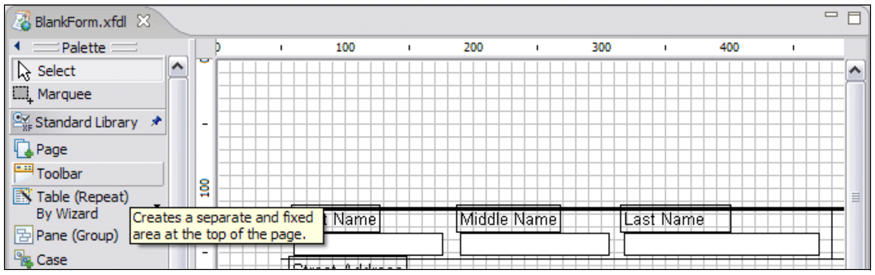


Figure 2-58 Create toolbar

2. Click the canvas. A toolbar is placed at the top of the page, as shown in Figure 2-59.

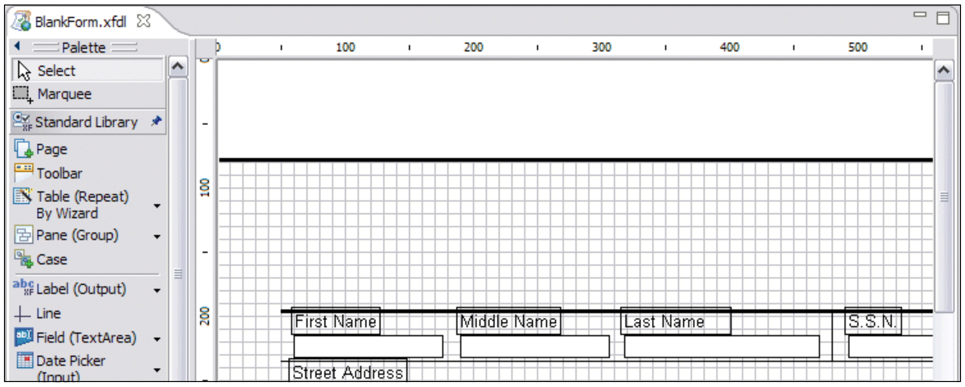


Figure 2-59   New toolbar has been added to form

> **Tip:** When you create a toolbar, the Designer gives it a sid of TOOLBAR and makes it the first item in the build order. Do not change the toolbar's sid or location in the build order. Toolbars must be the first item in the build order.

Toolbar color

You can change the color of the form's toolbar to make it stand out from the rest of the form. To change the color of a toolbar:

1. Click a blank area in the tool bar.
2. In the Properties view, expand **Appearance**.
3. Click the ellipse button (...) within the bgcolor value field.

   > **Tip:** Instead of using the pop-up window, you can enter a text value in the bgcolor field. For instance, blue, light blue, navy blue, and white.

4. A pop-up window opens, as shown in Figure 2-60. Select a color (we picked navy blue) and click **OK**.

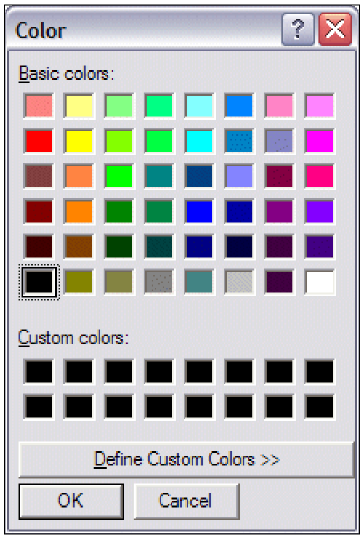


Figure 2-60   Select color

2.5.2 Adding items to a toolbar

In this section we enhance our toolbar by adding functional buttons and branding to the toolbar. We cover these subjects in the following sections:

- Buttons
- Add image

Buttons

We need to add three functional buttons to our form. If there were more than one page to our form we would also need to add page navigation items to our form. The toolbar is a good place to position our functional items. Since this is a single page form we are only going to need the following buttons:

- A print button
- A done button
- An e-mail submit button

Buttons are the most common way for users to trigger actions.

Tip: You can also use cells within a pop-up list, combo box list, or box list to trigger actions.

To add user-triggered actions to your XFDL form, you can add buttons that execute a broad range of actions, as listed in Table 2-9.

Table 2-9 Actions of buttons within XFDL

Action	Description
cancel	Closes the form. If any changes were made to the form since the last save or submit, then the user is told that the form has changed, and is allowed to stop the cancellation.
display	Allows the user to view one or more attached files.
done	Submits form data and then closes the form.
enclose	Allows the user to attach one or more files in the form.
extract	Allows the user to extract a copy of one or more attachments to disk.
link	Switches to a different page in the form.
print	Prints the page or the form, depending on the controls you set up.
refresh	Refreshes the form. You may want users to refresh a form when viewing the form via Webform Server.
remove	Allows the user to remove one or more attachments from the form.
replace	Opens a file from the Internet or the user’s computer and displays it in the current window.
saveform	Saves the form to the current file.
saveas	Saves the form, prompting the user for a file name and location.
select	This is the default type for buttons and cells. For buttons, lets you capture an event in order to run a formula (compute). For example, you can set up a button that, when clicked, calls the duplicate function to duplicate a row of items. For cells in a pop-up list, combo box list, or box list, records the user’s selection.

Action	Description
signature	For buttons only: allows the user to sign the form.
submit	Submits form data to a server and leaves the form open.

Note: For detailed information about button types, see the type option in the Workplace Forms XFDL Specification document.

You can place buttons both in the form and in the form's toolbar. Buttons placed in the toolbar are fully functional, but are not printed as part of the form. Placing eForm-only items, such as e-mail, print, or next page buttons, in a toolbar, allows your form to function as an eForm and a paper form.

Add those three button items to our toolbar:

1. In the palette, click the **Button (Non-XForms)** item, as shown in Figure 2-61.

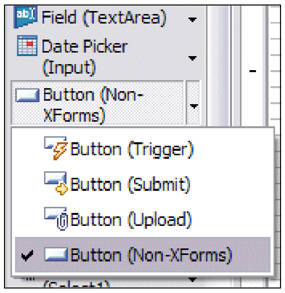


Figure 2-61 Button Non-XForms

2. Click within the toolbar area of the form.

Tip: The Designer automatically resizes the toolbar so that the items fit.

If you want to increase the size of the toolbar, simply move one of the items in the toolbar down, so that part of it is past the lower edge of the toolbar. The Designer will automatically adjust the size of the toolbar to fit the item.

3. Repeat steps 1 and 2 twice more to add two more buttons to the form.

Tip: For similar items you can accelerate form development by first defining the look and feel of an item and then copying and pasting the item as many times as needed.

For example, instead of repeating steps 1 and 2 above, you could copy the first button item with the Ctrl+C key combination followed by two Ctrl+V key combinations.

Using the Properties view, define the following properties for each button:

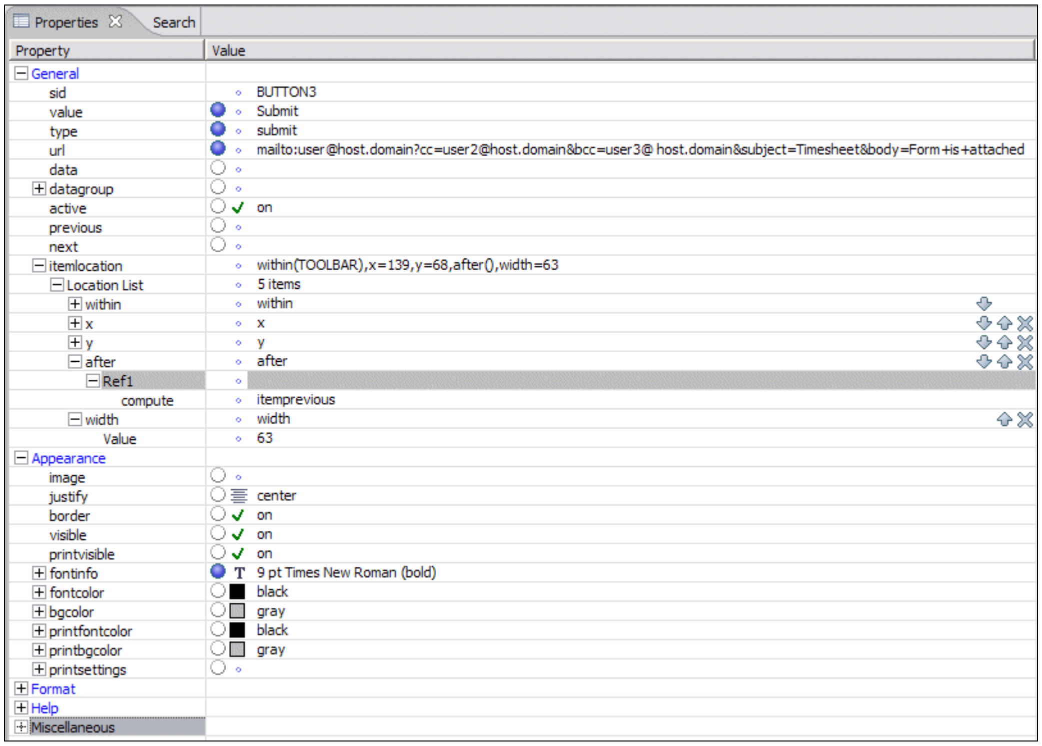
- Button1
  - name = *Print*
  - type = *print*
  - Item Location → Location List → x → value = 50
  - Item Location → Location List → y → value = 50
  - Item Location → Location List → > width → value = 63

- Button2
  - name = *Done*
  - type = *done*
  - Item Location → Location List → after → > Ref1 → compute = itemprevious
  - Item Location → Location List → width → value = 63
- Button3
  - name = Submit
  - type = Submit
  - Item Location → Location List → after → Ref1 → compute = itemprevious
  - Item Location → Location List → width → value = 63
  - In the URL value field, type a URL with a `mailto:` format, as shown in Example 2-9. (Note: It should be all one line, and you should substitute valid e-mail addresses.)

Example 2-9 "Mailto" code example

```
"mailto:user@host.domain?cc=user2@host.domain&bcc=user3@
host.domain&subject=Timesheet&body=Form+is+attached"
```

See Figure 2-62 for a image of the Button3 properties.


Properties | Search

Property	Value
⊟ General	
sid	BUTTON3
value	Submit
type	submit
url	mailto:user@host.domain?cc=user2@host.domain&bcc=user3@ host.domain&subject=Timesheet&body=Form+is+attached
data	
⊞ datagroup	
active	✓ on
previous	
next	
⊟ itemlocation	within(TOOLBAR),x=139,y=68,after(),width=63
⊟ Location List	5 items
⊞ within	within
⊞ x	x
⊞ y	y
⊟ after	after
⊟ Ref1	
compute	itemprevious
⊟ width	width
Value	63
⊟ Appearance	
image	
justify	center
border	✓ on
visible	✓ on
printvisible	✓ on
⊞ fontinfo	9 pt Times New Roman (bold)
⊞ fontcolor	■ black
⊞ bgcolor	▨ gray
⊞ printfontcolor	■ black
⊞ printbgcolor	▨ gray
⊞ printsettings	
⊞ Format	
⊞ Help	
⊞ Miscellaneous	

Figure 2-62 Button3 properties

Preview the form. Fill in the required fields (first name, last name, and SSN). Once the required fields are filled, test your buttons. Return to the Design Panel when finished.

Add image

Use images on your forms to give them a unique look. You can use images to add department or corporate logos to the title, customize buttons or labels, or add small images like arrows to help users navigate through your form.

Note: You should consider the type, quantity, and size of the images you include on your forms, as they can make a form larger and therefore slower to transmit, as well as have increased storage requirements. To help keep your images small, most graphics editing applications provide you with the ability to reduce file size by reducing the number of colors, reducing the resolution, altering the compression, changing to either black and white or gray scale.

The Designer supports the following image formats:

- Bitmap (.bmp)
- Joint Photographic Experts Group (.jpeg)
- Portable Network Graphics (.png)
- Graphics Interchange Format (.gif)
- Sun Raster (.rast)

Restriction:

- The Designer does not support transparency or animation, and only supports the 87a format for .gif graphic formats.
- The Viewer supports fewer types of JPEG images than the Designer supports. A JPEG image that appears correctly in the Designer may not be displayed in the Viewer. If you plan to use JPEG images in your form, test one image in the Viewer to ensure that the JPEG type is supported.
- The Designer does not support progressive compression for JPEG images.

Before you can add an image to a form or to an item (such as a button or a label), you need to enclose the image as a data file for a specific page in the Enclosures view.

Note: The information contained in pages in the Enclosures view does not show you where the enclosure is displayed. It shows you where the actual data resides. Images are stored as data items. When you enclose a file, a data item is created for that specific page.

To enclose an image file:

1. In the Enclosures view, select a page under Data. By default, every form has one page named PAGE1.
2. Right-click and select **Enclose File**, as shown in Figure 2-63.

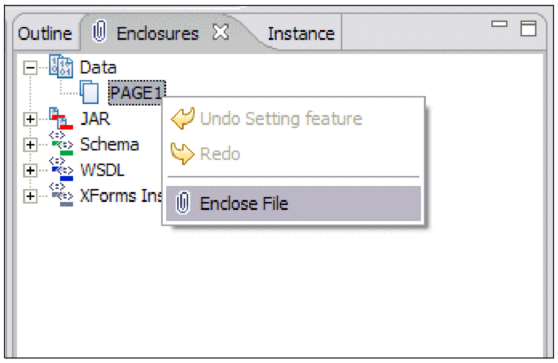


Figure 2-63 Enclose file

3. Browse to the location of the image.

4. Select the **IBM Workplace Forms Logo** and click **Open**.

You can now add the image directly into the toolbar of your form. Drag the enclosed file to the toolbar and absolute align it after the last button, and then absolute align it again center to center vertically with the same button. When finished it should appear as shown in Figure 2-64.

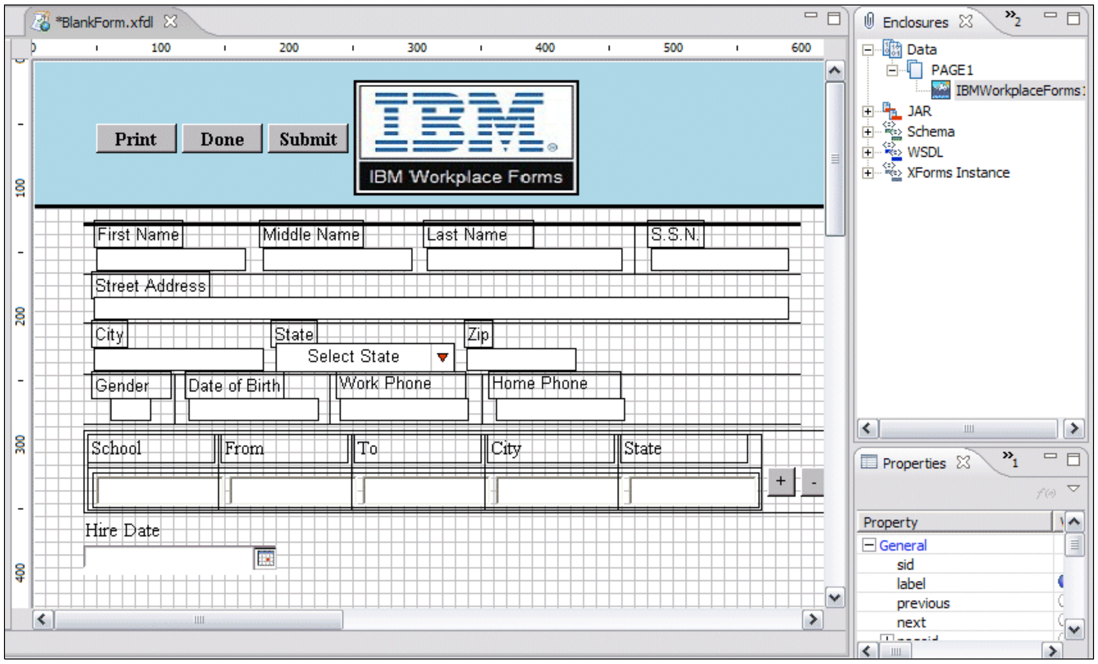


Figure 2-64 Toolbar with Graphic and buttons

Note: You can also add an image file to a form by dragging the file from your workspace or Windows Explorer onto the PAGE in the Enclosures view.

2.6 Add computes

In workplace forms you can build intelligent dynamic forms by defining built-in logic, calculations, and formulas that dictate form presentation, field values, and even unique form behavior based on user interactions. In XFDL these logical operations are called *computes*, and with XForms similar computes are applied via *binds*.

In this section we introduce basic concepts needed to create computes and provide simple examples. We go into greater detail on this topic and provide more advanced examples using XForms binds in Chapter 5, “Building the base scenario: stage 1” on page 173.

Topics covered in this section include:

- References
- Computes
- Operators and the order of operations
- Creating a field calculation

2.6.1 References

References allow us to refer to other specific items and their options by providing a *path*, which refers to specific values or content in a form so that you can copy data or build a compute to calculate a result. This means that you can refer to an option anywhere in the form. When you write your own computes you need to understand how to reference other items. Since nearly all computes rely heavily on references, learning to write XFDL references is fundamental to understanding how to build dynamic forms.

A reference, like the node structure, has four levels, as introduced in Figure 2-3 on page 24: page, item, option, argument, and occasionally an indirect membership value:

- page (palette item)

  The name (for example, the sid) you have given to the page. This is only necessary if the item you are referring to is on a different page.
- item (palette item)

  The name (for example, the sid) you have given to the item. This is only necessary if the property that you are referring to is in a different item.
- option (item property names)

  What is referred to as a property in the Designer, is referred to as an option in XFDL.
- argument ([n] or [name])

  The position in the array of the array element, if you are referring to a property that is defined by an array. This is either a number or a variable name.
- -> (the dereference symbol)

  Represents indirect membership. This is used when the reference is in a list of choices.

There are two types of references:

- Direct reference: refers directly to a specific option anywhere in the form. Look at Example 2-10. To refer to the value of the field firstName1 on page 1 of the employee information form, you would use a direct reference.

  Example 2-10 Direct reference

  ```
  PAGE1.firstName1.value
  ```

5. Indirect reference: refers to a choice made in a list. Consider Example 2-11. To refer to the selected choice in the Combobox list called *state*, you would use an indirect reference.

   Example 2-11 Indirect reference

   ```
   PAGE1.state.value->value
   ```

For the context of this topic it may help to think of each level as containers, where each container is held within its parent, as shown in Figure 2-65.

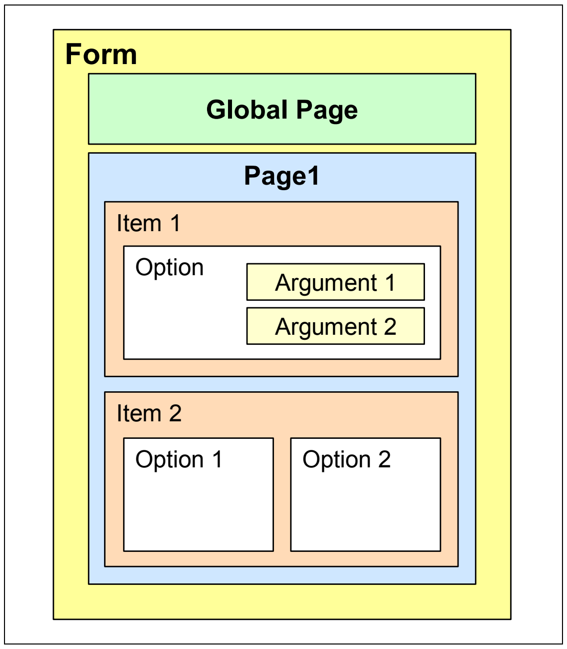


Figure 2-65 Logical containers

The key to creating your reference is to *open* all of the containers to get to the one you need. When constructing your reference to the first three levels, the SID of each container is appended together and separated by a period. This is a direct reference and the syntax is shown in Example 2-12.

Example 2-12 Direct reference

```
Page1.Item2.Option1
```

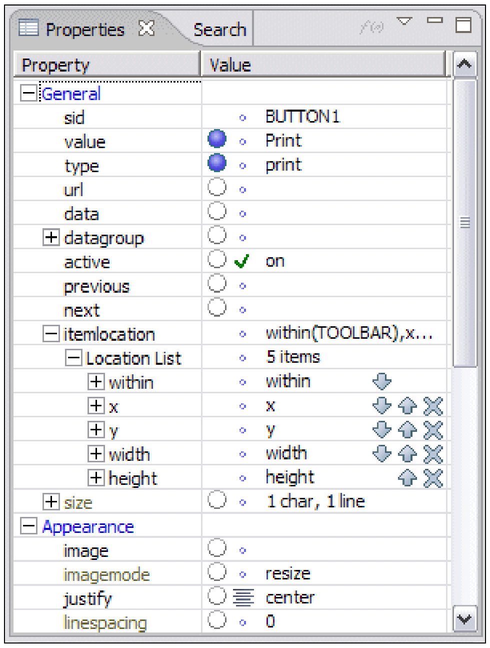
Tip: The SIDs are case sensitive. PAGE1 is not equal to Page1.

The syntax changes slightly once we descend to the option container because it is an array of arguments. This is still considered a direct reference, but arguments, within the reference, are denoted by using square brackets, as shown in Example 2-13.

Example 2-13 Direct reference of an array value

```
Page1.Item1.Option[Argument1]
```

XFDL supports an infinite level of arrays. An example of an option that contains an array of arguments is the itemlocation for the print button on the employee information form. Consider the values defined there, as shown in Figure 2-66.



Properties | Search

Property	Value
General	
sid	BUTTON1
value	Print
type	print
url	
data	
datagroup	
active	on
previous	
next	
itemlocation	within(TOOLBAR),x...
Location List	5 items
within	within
x	x
y	y
width	width
height	height
size	1 char, 1 line
Appearance	
image	
imagemode	resize
justify	center
linespacing	0

Figure 2-66 Print button properties

There are five array elements to the itemlocation option. The code for these properties in context of the reference is provided in Example 2-14.

Example 2-14 Item location properties code

```
<page sid="PAGE1">
   <global sid="global">
      <label>PAGE1</label>
      <designer:pagesize>800;600</designer:pagesize>
   </global>
   <toolbar sid="TOOLBAR">
      <bgcolor>#ADD8E6</bgcolor>
      <designer:height>116</designer:height>
   </toolbar>
   <button sid="BUTTON1">
      <itemlocation>
         <within>TOOLBAR</within>
         <x>50</x>
         <y>50</y>
         <width>63</width>
         <height>23</height>
      </itemlocation>
```

If we wanted to reference the x value of itemlocation properties then we could define the reference as shown in Example 2-15.

Example 2-15 Item location reference

```
PAGE1.BUTTON1.itemlocation[2] <!-- by array index as the argument -->
```

Or we could do it this way:

```
PAGE1.BUTTON1.itemlocation[x] <!-- by array element name as the argument -->
```

Tip: To avoid confusion, always use the full path, including Page and item Sid.

Note: When defining references for options (properties) such as itemlocation, it is better to use the name value for the argument since the order of array elements in the itemlocaion option can be modified. If the x value were moved up or down in order, the reference to the array index of 2 would now point to some other element.

2.6.2 Computes

Formulas, or calculations, enable your form to do mathematical or logical operations quickly. In this section we cover the mathematical computes and conditional computes.

Mathematical computes

Typically, form designers want to reduce the potential for user errors. You can drastically reduce the potential for mathematical errors by allowing the form to perform all required mathematical computes. You create mathematical formulas by embedding computes in the form.

Conditional computes

The second type of XFDL compute is the conditional expression, or decision statement. Like mathematical computes, these conditional computes are embedded in the XFDL code, and execute on the computer where the form is running. Computes can send a user to a different page, determine an e-mail address or URL to which a form should be submitted, automatically calculate a compound interest factor, and so on.

IF/THEN/Else expressions are used for conditional evaluations. The XFDL syntax for these conditional expressions are written as:

```
“x ? y : z”;
```

Where x is the boolean condition, y is the result if x evaluates to true, and z is the result should x evaluate to false. The expression can be read as:

```
IF x THEN y ELSE z
```

Tip: Once you have all of the visible items on the form, then apply calculations, formatting, and logic.

When to use computes

Computes are typically used in the following situations:

- When you need your form to act like a spreadsheet and perform mathematical operations on the values entered by the user.

- When you need the form to make a decision based on the values entered by the user. For instance, you may want the dependents section of a form to be made active or inactive based on whether the user has children.
- When you want to add dynamic elements to your form.

Common situations in which computes are used include:

- Copying information from one field to another
- Changing the text displayed by an item or setting the value of a field
- Changing whether an item is active or inactive
- Changing the URL associated with a button or choice list (for transmitting the form)

For detailed information about computes and items, see the Workplace Forms XFDL Specification document.

Planning a compute

Before you create a compute in your form, review the following:

- Establish what you want the compute to do.
  - Do you want the compute to perform basic mathematics, such as add, subtract, divide, or multiply values?
  - Do you want to use the compute to have your form make decisions based on user input?
- Establish where the data results will be written.
  - Will the data be seen by the user in another field on the form?
  - Will the data be sent to a database, e-mail, or URL?
- Establish the characteristics of the form, page, and items.

  For example: The bgcolor property set at the form global level defines the background color of all pages on the form, whereas a bgcolor option set at the item level defines the background color for that specific item.

- Establish whether you will use a function.

Following these guidelines will be of great value to you when designing electronic forms and help you to avoid putting unnecessary effort in form design time.

2.6.3 Operators and the order of operations

In order to build a formula you will need to use mathematical and logical operations. To take full advantage of these operators you will also need to understand the order in which they are evaluated. In this section a table is provided that shows the number of operators supported in XFDL and a list of the order in which they are evaluated. You will need to familiarize yourself with these topics.

The operators shown in Table 2-10 are available when writing a formula.

Table 2-10 Operators

Operator	Description
+	Addition (or concatenation, if text)
-	Subtraction (or negative, if placed in front of an integer)

Operator	Description
*	Multiplication
/	Division
^	Exponentiation
%	Percentage
>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to
!=	Not equal to
&&	AND
and	AND
||	OR
or	OR
!	NOT
x?y:z	IF x then y else z
=	Assignment
.	Structure membership
[ ]	Array membership
->	Indirect membership

Order of operations

Operations are evaluated in the following order:

1. Membership
2. Exponentiation
3. Multiplication, division, and unary minus
4. Addition and subtraction
5. Relational (greater than, less than, equal to, and so on)
6. Logical AND
7. Logical OR
8. Logical IF THEN ELSE

Also, when defining functions directly in the source code you must be aware of some restricted values and use the escaped version in your code. Table 2-11 shows the most commonly used restricted characters.

Table 2-11 Restricted characters

Symbol	Description	Escaped format
&	Ampersand	&amp;
‘	Apostrophe	&apos;
<	Less than	&lt;

Symbol	Description	Escaped format
>	Greater than	&gt;
<CR>	Carrage Return	&#xA;

2.6.4 Creating a field calculation

In this section we discuss two types of field calculations for our employee history form — one that will use the Compute wizard to display the current date automatically, and the second that will calculate yearly salary based on hourly rate and employee type (full time/part time).

These topics are covered in the following sections:

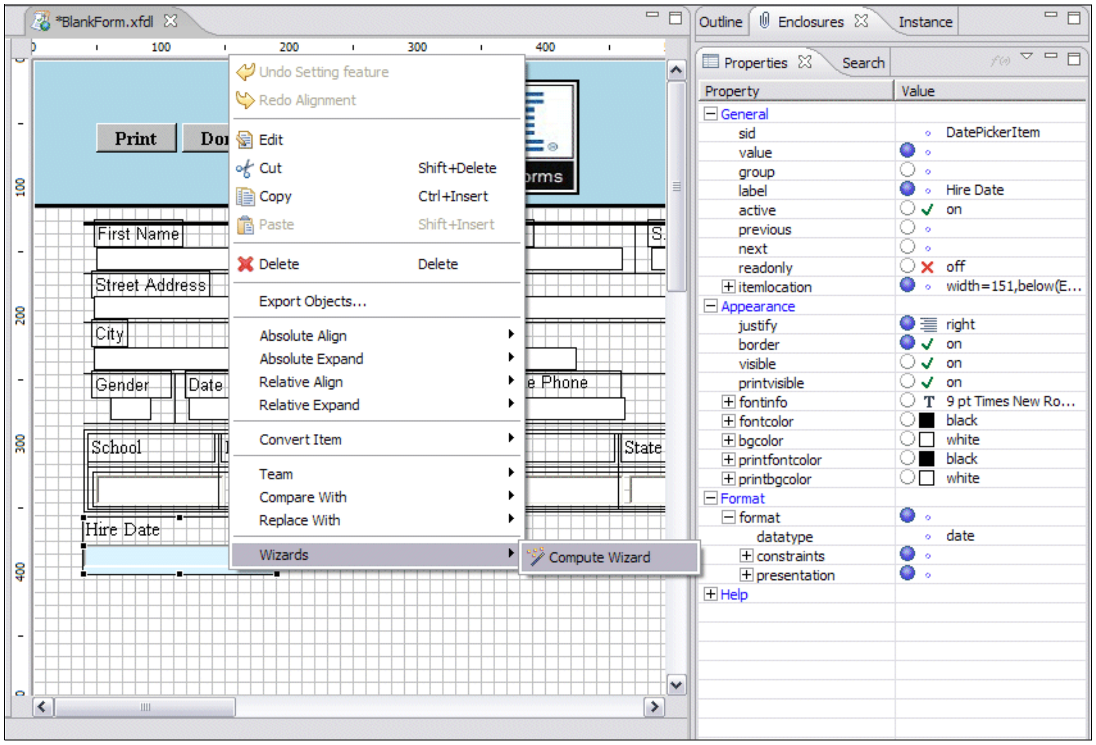
- Displaying the current date automatically
- Example on page 98

Displaying the current date automatically

Unlike paper forms, XFDL forms can perform sophisticated checks and calculations while the user fills out the form. This can prevent mistakes right at the source and provide a high level of comfort while filling out the form. You can set up a field to automatically display the current date when the form opens.

To display the current date automatically:

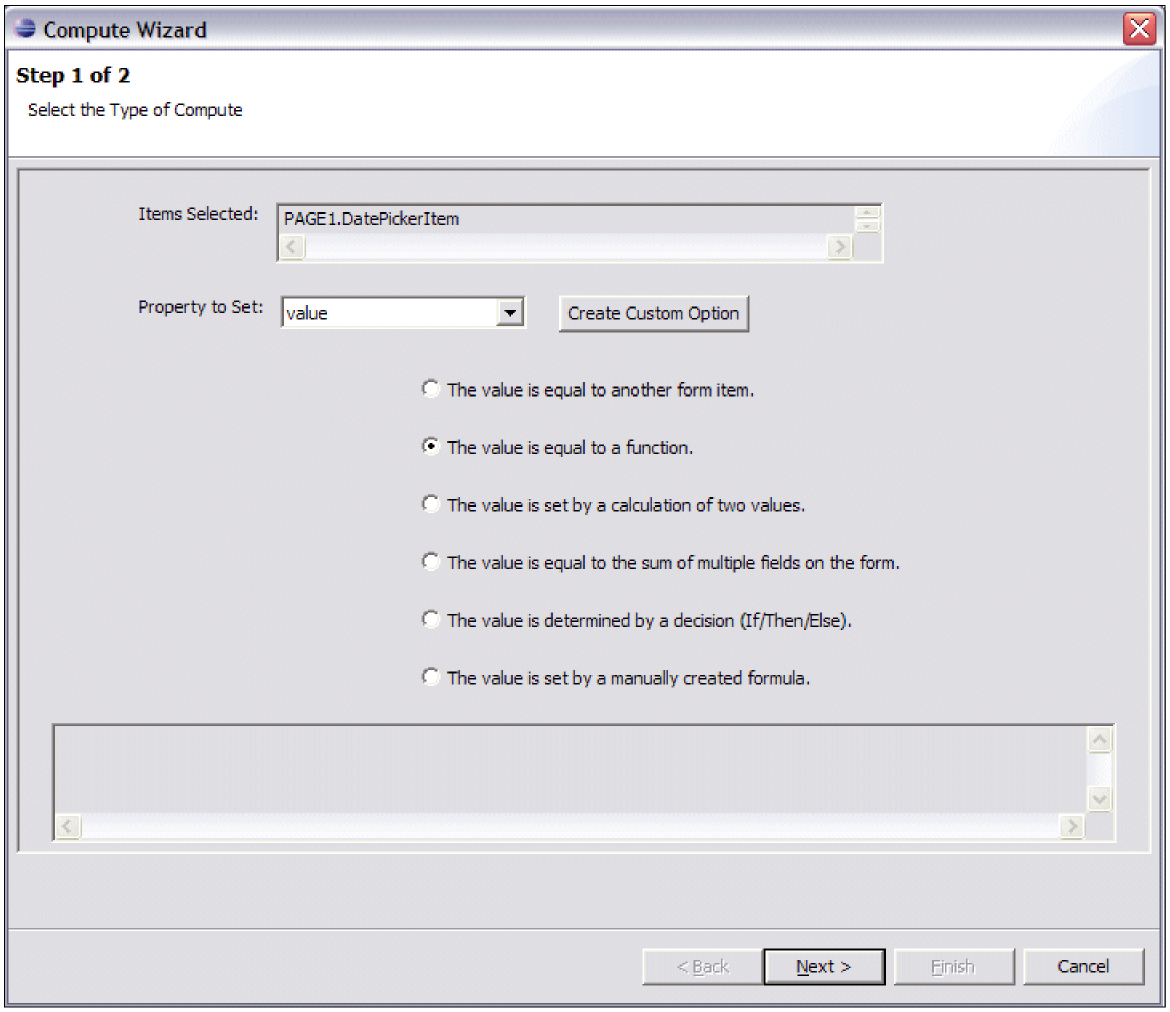
1. Select the **DatePickerItem** in the employee information form we have been working with.
2. Right-click the item and click **Wizards** → **Compute Wizard**, as shown in Figure 2-67.



Property	Value
General	
sid	DatePickerItem
value	
group	
label	Hire Date
active	✓ on
previous	
next	
readonly	✗ off
itemlocation	width=151,below(E...
Appearance	
justify	right
border	✓ on
visible	✓ on
printvisible	✓ on
fontinfo	T 9 pt Times New Ro...
fontcolor	■ black
bgcolor	□ white
printfontcolor	■ black
printbgcolor	□ white
Format	
format	
datatype	date
constraints	
presentation	
Help	

Figure 2-67 Compute wizard

3. From the Property to Set list, click value and click **The value is equal to a function**, as shown in Figure 2-68. Click **Next** when finished.


Compute Wizard

Step 1 of 2

Select the Type of Compute

Items Selected: PAGE1.DatePickerItem

Property to Set: value

( ) The value is equal to another form item.

(●) The value is equal to a function.

( ) The value is set by a calculation of two values.

( ) The value is equal to the sum of multiple fields on the form.

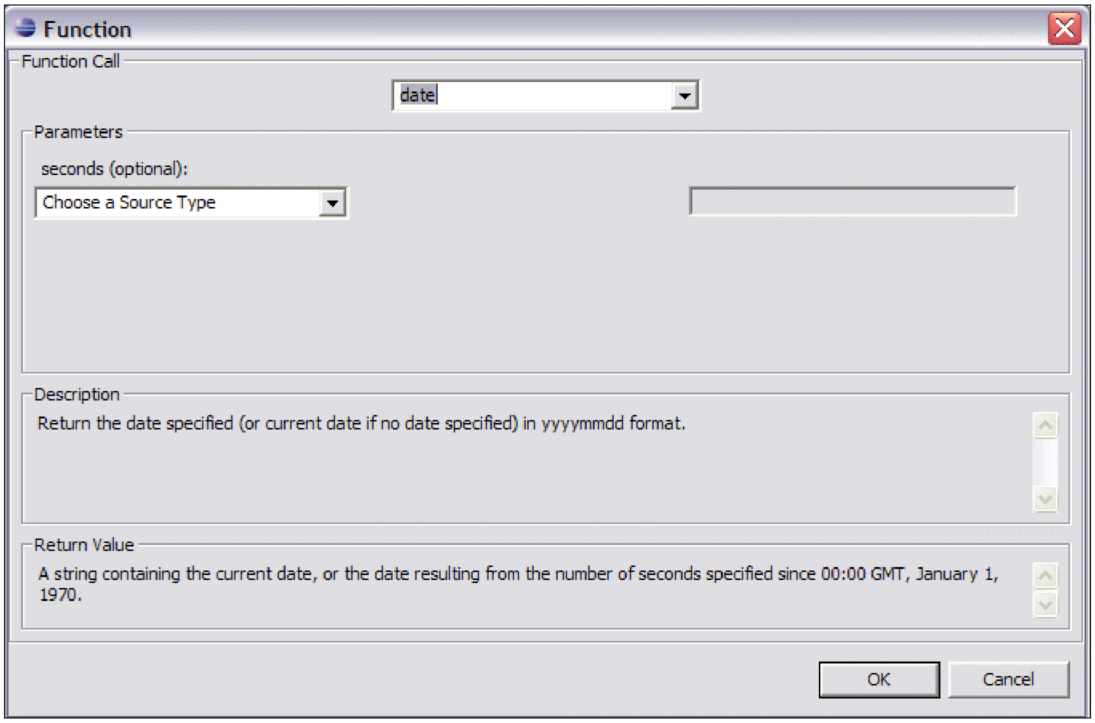
( ) The value is determined by a decision (If/Then/Else).

( ) The value is set by a manually created formula.

Figure 2-68 Set value equal to a function

4. On the next screen click **Function**. The Function window is displayed.

5. Set the function call to date, as shown in Figure 2-69.



Return the date specified (or current date if no date specified) in yyyymmdd format.

A string containing the current date, or the date resulting from the number of seconds specified since 00:00 GMT, January 1, 1970.

Figure 2-69 Function equal to date

6. Click **OK** and then click **Finish**.

Preview the form. Notice that when the form loads, the Date field is automatically populated with the current date.

Calculate yearly salary

In this section we create a compute that calculates yearly salary based on the condition of the user interaction.

To calculate yearly salary we need to add three more fields to our form. The first is an open field to allow us to enter hourly rate, the second is a drop-down list that shows employee type (full time/part time), and the third and final field needed for this example is a read-only field that displays yearly salary to display the result.

Add Hourly Rate field

As shown in Figure 2-70, use the drop-down menu in your palette to select and add one Non-XForms field anywhere on the design canvas. This will be our hourly rate field.

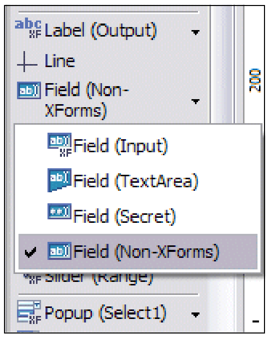


Figure 2-70 Select Non-XForms Field from palette

Since the employee information form we created has a dynamic table, we need to use relative alignment when adding our new items to the form. Relative align the hourly rate field below the DatePickerItem, as shown in Figure 2-71.

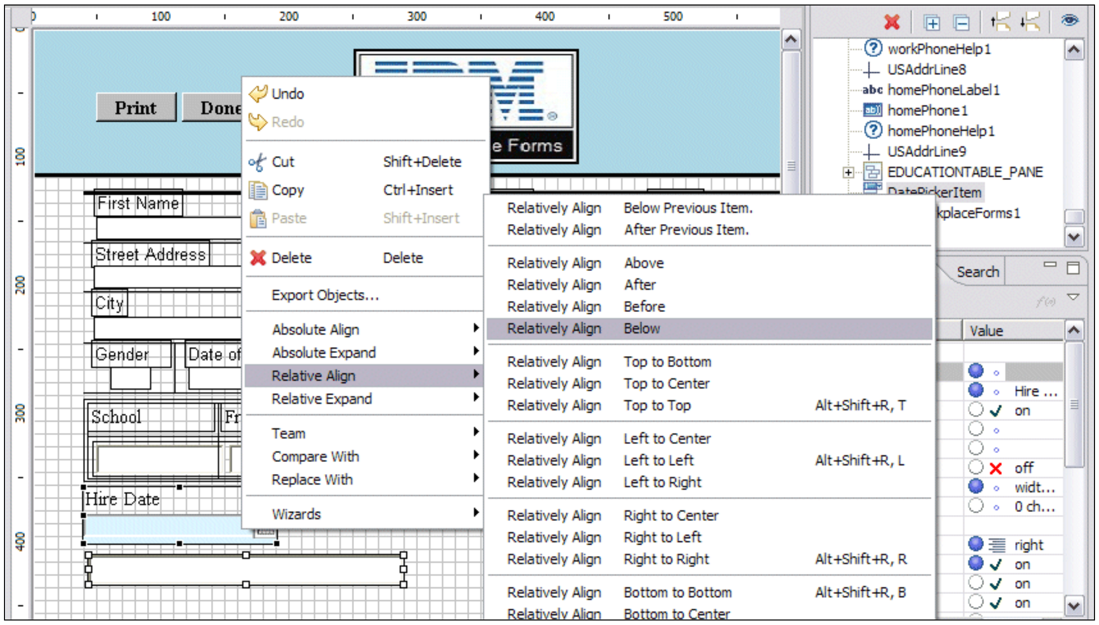
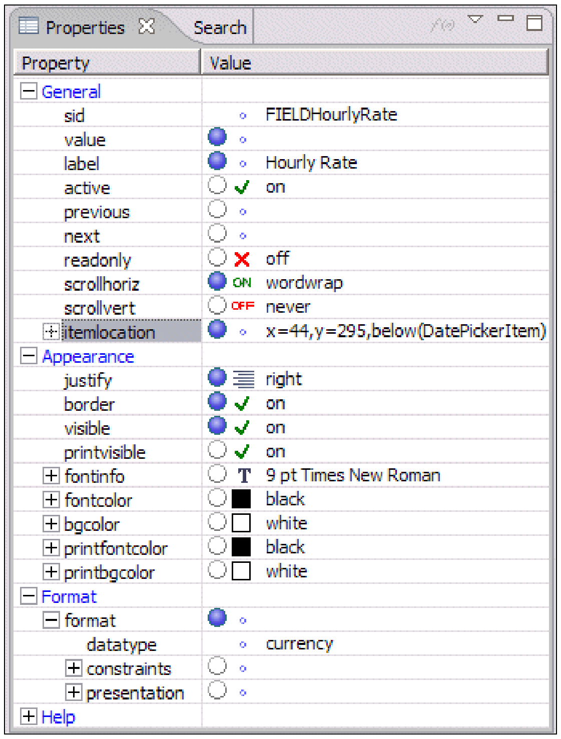


Figure 2-71 Relative align hourly rate field below date

Next we define the properties for this form. Set the field name to FieldHourlyRate, set the label value to Hourly Rate, set the justify setting to right, and set the datatype format to currency. See Figure 2-72 for help.



Property	Value
General	
sid	FIELDHourlyRate
value	●
label	● Hourly Rate
active	✓ on
previous	
next	
readonly	✗ off
scrollhoriz	● ON wordwrap
scrollvert	OFF never
itemlocation	● x=44,y=295,below(DatePickerItem)
Appearance	
justify	● right
border	● ✓ on
visible	● ✓ on
printvisible	✓ on
fontinfo	T 9 pt Times New Roman
fontcolor	■ black
bgcolor	□ white
printfontcolor	■ black
printbgcolor	□ white
Format	
format	●
datatype	currency
constraints	
presentation	
Help	

Figure 2-72 Hourly rate properties

Add employee type list

Now we can add a Non-XForms List item to the form, as shown in Figure 2-73. This item contains just two choices: full time and part time.

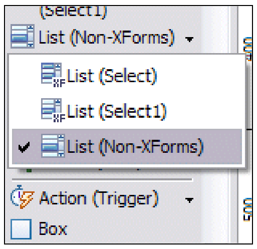


Figure 2-73 Select List (Non-XForms) item from palette

After placing it on the form, right-click the list item and select **Relative Align - After Previous Item**, as shown in Figure 2-74.

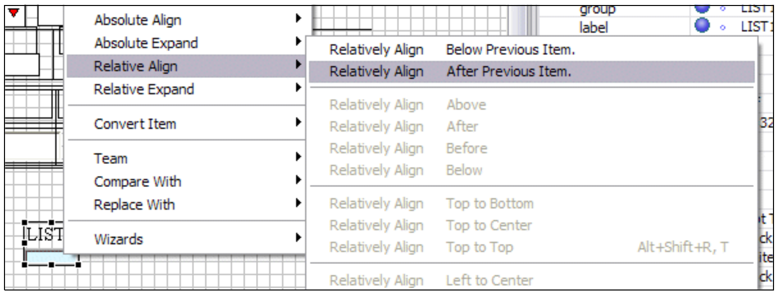

Absolute Align
Absolute Expand
Relative Align
Relative Expand
Convert Item
Team
Compare With
Replace With
Wizards
Relatively Align Below Previous Item.
Relatively Align After Previous Item.
Relatively Align Above
Relatively Align After
Relatively Align Before
Relatively Align Below
Relatively Align Top to Bottom
Relatively Align Top to Center
Relatively Align Top to Top Alt+Shift+R, T
Relatively Align Left to Center

Figure 2-74 Relative align after previous Item

To define our choices for this list item we need to add some choices in the form of two cells associated with our list item. Select the **Non-XForms Cell** item from the palette and then click the list item on the canvas to add a cell to the list. Repeat the steps one more time to add a second cell to the list. This will give us two choices, as shown in Figure 2-75.

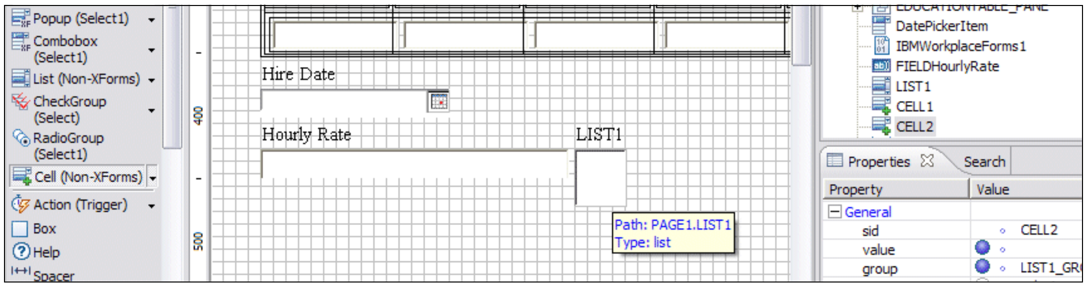


Figure 2-75 Add cells to list

Notice that there are two new items in the form outline: CELL1 and CELL2. Also notice that the list item on the canvas has expanded to allow for the viewing of those items. Next we define the properties for the list item, and the two cells.

For the list item, change the label value from LIST1 to `Employee Type`.

Since cell items are not visible on the form canvas, you cannot directly select them. To set the properties for the cell you will have to use the Form Outline view to select them, as shown in Figure 2-76.

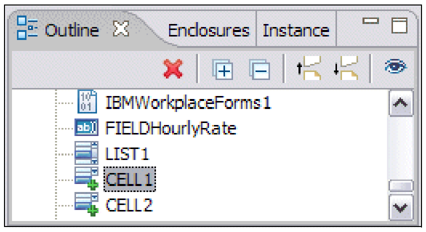
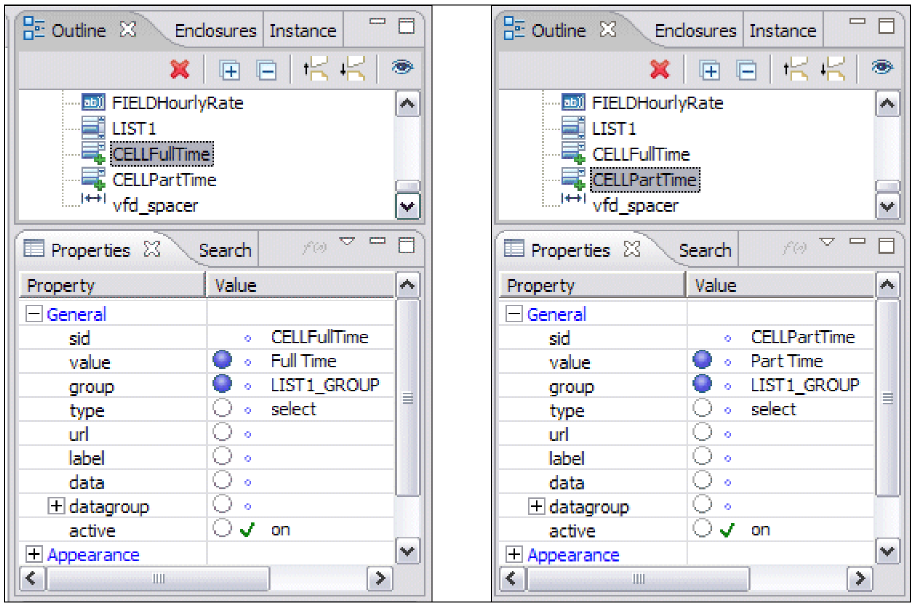


Figure 2-76 Access cell items via the Outline view

Now that we can get to our new cell items we want to set the sid and the value properties for both of these items, as shown in Figure 2-77. (Cell1 is shown on the left. Cell2 is shown on the right.)



- FIELDHourlyRate
- LIST1
- CELLFullTime
- CELLPartTime
- vfd_spacer

Property	Value
General	
sid	CELLFullTime
value	Full Time
group	LIST1_GROUP
type	select
url	
label	
data	
datagroup	
active	✓ on
Appearance	

- FIELDHourlyRate
- LIST1
- CELLFullTime
- CELLPartTime
- vfd_spacer

Property	Value
General	
sid	CELLPartTime
value	Part Time
group	LIST1_GROUP
type	select
url	
label	
data	
datagroup	
active	✓ on
Appearance	

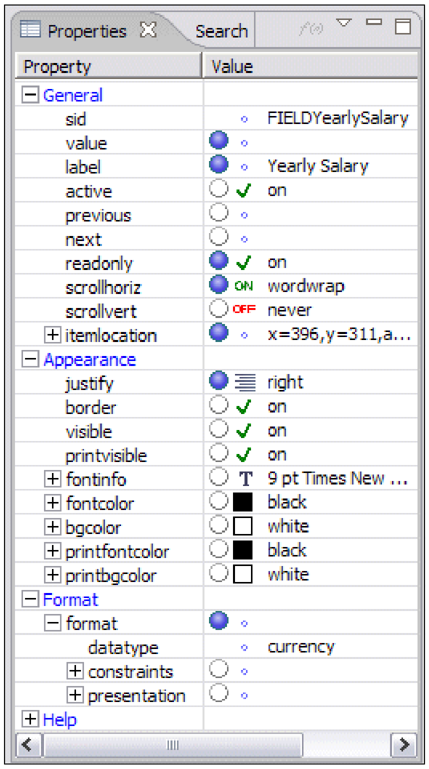
Figure 2-77 Cell properties

Add Yearly Salary field

This is the last item we want to add to the form to complete our example. As shown in previous steps, from the palette select and add a Non-XForms field item anywhere on to the form design canvas. Use relative alignment to place this field after the EmployeeType list item. Finally, define the properties for this item as follows:

- sid = "*FIELDYearlySalary*"
- label = "*Yearly Salary*"
- readonly = "*on*"
- justify = "*right*"
- datatype = "*currency*"

Figure 2-78 shows these properties as applied in the Designers Properties view.



Property	Value
General	
sid	FIELDYearlySalary
value	
label	Yearly Salary
active	✓ on
previous	
next	
readonly	✓ on
scrollhoriz	ON wordwrap
scrollvert	OFF never
itemlocation	x=396,y=311,a...
Appearance	
justify	right
border	✓ on
visible	✓ on
printvisible	✓ on
fontinfo	T 9 pt Times New ...
fontcolor	■ black
bgcolor	□ white
printfontcolor	■ black
printbgcolor	□ white
Format	
format	
datatype	currency
constraints	
presentation	
Help	

Figure 2-78 Yearly salary field properties

Let us align and resize these items a little better now that we have them all on the form. Click the **FIELDYearlySalary** field and right-click the **FIELDHourlyRate** field. Select **Relative Align - bottom to bottom**. Then using the same steps, relative align the Employee Type list item top to top with the Hourly Rate field. To resize all of the items at once, select them all, and then right-click the **DatePickerItem**, select **Absolute Expand - Make Same Width**. When finished, the form should look like that shown in Figure 2-79.

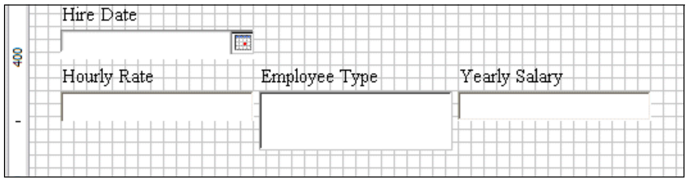


Figure 2-79 Alignment and resizing of compute items

Define the compute

There are a number of different approaches we could take here to calculate yearly salary. In this section we use what was learned earlier in this chapter to build the compute manually in the source code. We take you through the logical process step by step and then add the finished logic to the code.

The math for this example is simple:

```
(hourly rate) X (employee type) X (52 weeks) = Yearly Salary
```

Using what we learned from 2.6.1, “References” on page 90, the calculation can be build using a combination of direct and indirect references, as shown in Example 2-16.

Tip: If the full path, or reference, to an item is not known, just place your mouse over the item on the design canvas and hold it there until a small window appears. That pop-up will display the reference.

Example 2-16 Mathematical compute

```
(PAGE1.FIELDHourlyRate.value * PAGE1.LIST1.value->value) * '52'
```

Tip: The Compute wizard can create simple computes of two values, but cannot write more complex expressions unless you manually define them. However, if you are having difficulty writing a complex compute, then you can use the wizard to show you the simpler components of your compute.

If we modify the value option for the yearly salary to include this compute it should work, but we have a problem. Although the rate is a dollar amount and the number of weeks is a fixed value, the employee type is a string. The calculation will fail if we try to use a mathematical operator on a string value. We need to substitute numerical values into our calculation for the selected employee type.

If Full Time is selected, we know that they work 40 hours a week, and if Part Time is selected then they work 20 hours a week. Since our list only has two items, that conditional statement is easily represented by an if\then\else statement:

```
If selected list item equals ‘Full Time’
   then the hours worked is 40,
      else the hours worked is 20
```

The logical expression translates to the XFDL code shown in Example 2-17.

Example 2-17 XFDL conditional statement

```
PAGE1.LIST1.value->value == 'Full Time' ? ('40') : '20'
```

We can use this conditional statement to perform our calculation. Using the same logic to include our mathematical expression, it would change to this:

```
If selected list item equals ‘Full Time’
   then the yearly salary is calculated by (hourly rate) X (40 hours) X (52
   weeks),
      else the yearly salary is calculated by (hourly rate) X (20 hours) X (52
      weeks)
```

The logical expression translates to the XFDL code shown in Example 2-18.

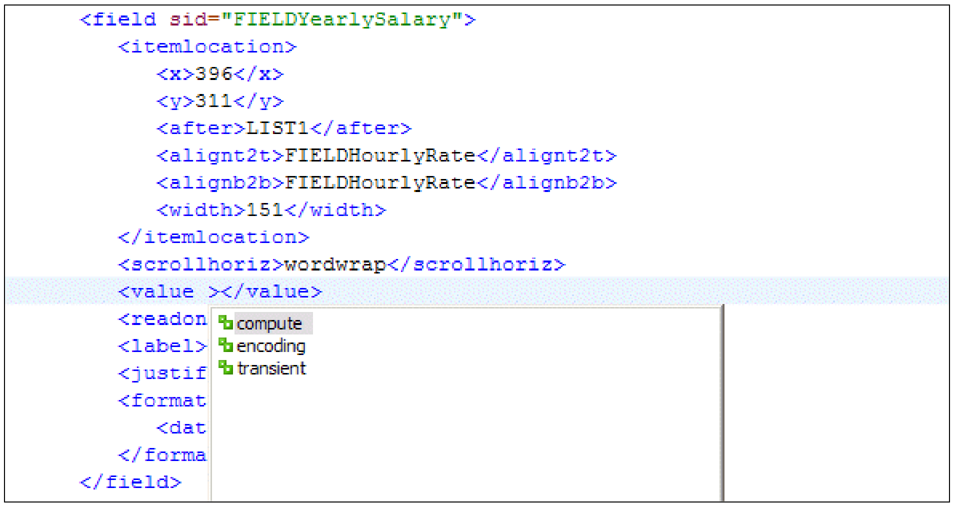
Example 2-18 XFDL conditional calculation

```
PAGE1.LIST1.value->value == 'Full Time' &#xA;
   ? (PAGE1.FIELDHourlyRate.value * '40') * '52' &#xA;
   : (PAGE1.FIELDHourlyRate.value * '20') * '52'
```

Now when this compute is calculated it will substitute numerical values for the string values in our list.

To add this code to the FIELDYearlySalary item, complete the following steps:

1. In the Designer, click the **FIELDYearlySalary** item once.
2. Click the **Source** tab located at the bottom left-hand corner of the Designer canvas.
3. The source code editor will automatically load to the code associated with the item you selected, saving us the time needed to locate it otherwise.
4. Locate the <value> option for FIELDYearlySalary.
5. Move your cursor to the end of the word 'value' and press the Space bar. A predictive text window opens in the editor showing valid code options. See Figure 2-80.

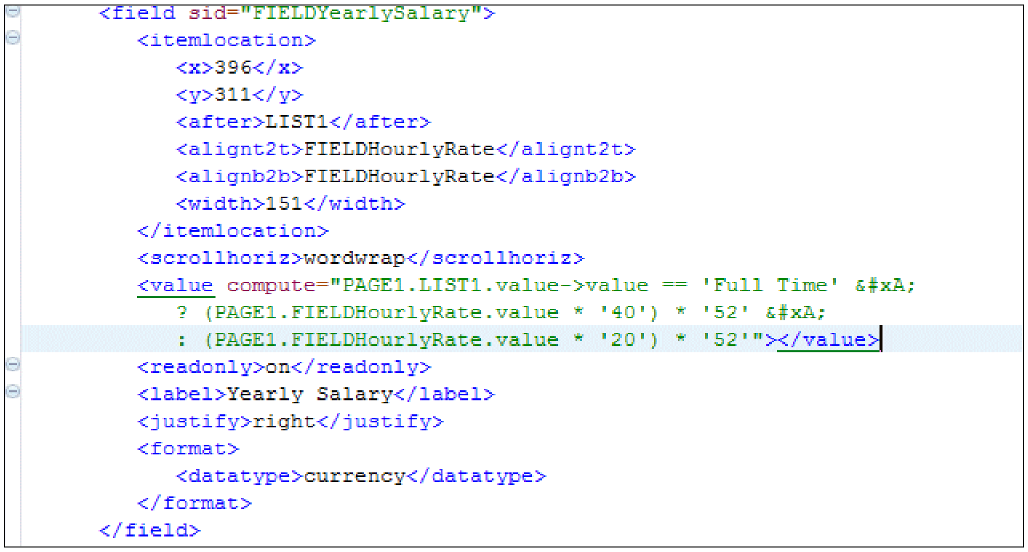


```
<field sid="FIELDYearlySalary">
   <itemlocation>
      <x>396</x>
      <y>311</y>
      <after>LIST1</after>
      <alignt2t>FIELDHourlyRate</alignt2t>
      <alignb2b>FIELDHourlyRate</alignb2b>
      <width>151</width>
   </itemlocation>
   <scrollhoriz>wordwrap</scrollhoriz>
   <value ></value>
   <readon
   <label>
   <justif
   <format
      <dat
   </forma
</field>
```

Figure 2-80   Predictive text options

6. Select **compute** by double-clicking the text, or just press the Enter key. The text is automatically added to your code.
7. To complete the syntax for a compute type the equals sign (=) and a double quotation mark ("). Notice that the end quotation mark is automatically added.

8. Place your cursor between the two quotation marks and add the compute exactly as shown in Example 2-18 on page 104. When finished your code should look like that shown in Figure 2-81.

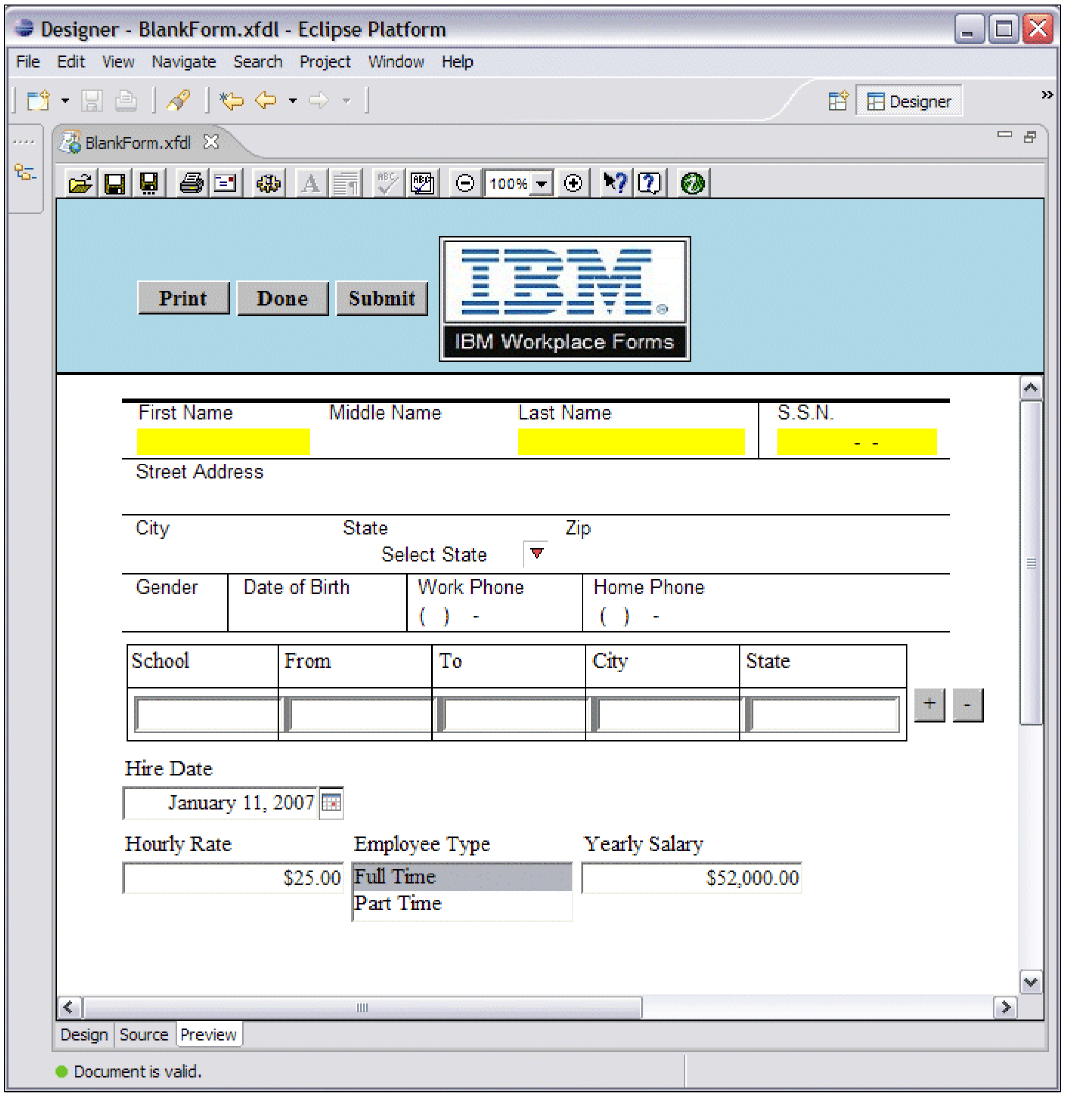


```
<field sid="FIELDYearlySalary">
   <itemlocation>
      <x>396</x>
      <y>311</y>
      <after>LIST1</after>
      <alignt2t>FIELDHourlyRate</alignt2t>
      <alignb2b>FIELDHourlyRate</alignb2b>
      <width>151</width>
   </itemlocation>
   <scrollhoriz>wordwrap</scrollhoriz>
   <value compute="PAGE1.LIST1.value->value == 'Full Time' &#xA;
      ? (PAGE1.FIELDHourlyRate.value * '40') * '52' &#xA;
      : (PAGE1.FIELDHourlyRate.value * '20') * '52'"></value>
   <readonly>on</readonly>
   <label>Yearly Salary</label>
   <justify>right</justify>
   <format>
      <datatype>currency</datatype>
   </format>
</field>
```

Figure 2-81 Calculation added to field

9. Click Ctrl+S to save your changes and check for errors. (By saving your changes the source edits will be compiled. If there are errors they will immediately be found.)

The compute is finished. Click the **Preview** tab located in the bottom left-hand corner of the Source Code editor to check your results. See Figure 2-82.



Hire Date: January 11, 2007

Hourly Rate	Employee Type	Yearly Salary
$25.00	Full Time Part Time	$52,000.00

Document is valid.

Figure 2-82 Preview of form with new compute set on yearly salary

Enter a value for hourly wage, and select an employee type. Notice that the yearly salary field is automatically populated with the calculation of both values. Changes to employee type and hourly rate automatically recalculate as applied.

Important: We have taken this approach in this exercise to illustrate the concepts of building computes using references, conditional statements, and mathematical calculations. There are other approaches that we could have taken to resolve this issue. In fact, if a similar issue were encountered in a real design environment then you may likely want to reconsider your approach to using a list box in this manner.

2.7 Signature buttons

The ability to provide security to a form is one of IBM Workplace Forms greatest strengths. In this section we provide an introduction to electronic signatures and how to use action buttons to secure a form.

Topics covered include:

- Overview
- Signature types
- Digital signatures
- Signature filters
- Creating multiple signatures
- Create a Clickwrap signature button

2.7.1 Overview

A user can sign a form by clicking a signature button on the form. You usually design a signature button with some text or a label that indicates its function (for example, Click to Sign). Typically, signature buttons are also larger than other buttons because they have to display the signer's name after the form is signed.

When a user clicks a signature button, the Digital Signature Viewer opens. The Digital Signature Viewer lets users sign forms, verify or delete existing signatures, and view the details of what parts of the form were signed. Users click **Sign** to sign the form. If they have more than one digital certificate installed on their computer, a dialog box appears, displaying all of the available signatures from which they can choose only one.

After the user selects a certificate, the form is signed and the Digital Signature Viewer displays the details of the signature. The user can then return to the form. In the form, the signature button changes to reflect the new signature. Typically, it displays the name and e-mail address of the signer (although this depends on the type of signature engine used). Once a form is signed, the Viewer prevents users from changing any of the signed information. Furthermore, when the user mouses over a signed item on a form, a tooltip indicates that the item is signed and cannot be altered.

When a user clicks a signature button, the Viewer automatically creates the following elements on the form:

- A signer option is added to the signature button. In general, this option contains the signer's name and e-mail address. However, the value assigned to this option depends on the signature engine that was used to sign the form.
- A signature item is created on the same page as the signature button. This item is given the name indicated in the button's signature option, and is used to store the details of the signature. You do not need to create the signature item yourself. The signature item will also include any of the filtering options used in the signature button.

A form may require any number of signatures. For example, a purchase order form may have two sections, one for the customer and one for an internal staff member who processes the order. The customer might fill out the first half of the form, and then add a signature that covers that portion of the form. The internal staff member might then review the form, and add a second signature that covers the entire form.

Digital signatures have two purposes:

- Identifying signers

  Digital signatures affix the signer's name and e-mail address to the document.

- Secure documents

  Digital signatures use encryption algorithms and digital certificates to guarantee form security.

When users sign a document, a *snapshot* of the document is taken and hashed to produce a unique number representing your document. If the document changes, hashing produces a different number. As a result, you can think of a hash as a document's digital fingerprint, unique and unmistakable.

Once a user has signed a form, any alterations to the signed portion of the form breaks the signature. If a malicious user tampers with the form's XFDL code after it has been signed, the Viewer can detects the change and will warn the next person to view the form that the information cannot be trusted in two ways:

- An error message will be shown immediately when the form is opened. It will warn that one or more of the form's digital signatures is invalid.
- The label on the signature button will be modified to read INVALID.

Important: This security measure does not prevent the original signers from making changes to the form. If they wish to make changes, they can simply delete their signatures from the form, modify their entries, and re-sign the form.

2.7.2 Signature types

Electronic signature refers to any signature that is created electronically, and it describes a category of technology. Within that category, there are many types of electronic signatures. The Designer supports a number of different signature types (signature engines). When you create a signature button, you must configure it to use a specific signature engine. Table 2-12 provides a list of signature types supported by IBM Workplace Forms with a description.

Table 2-12 Electronic signature types

Electronic signature type	Description
Digital signatures	Digital signatures are among the most secure electronic signatures. When you use digital signatures, each user is given a digital certificate. They are discussed in great detail in the 2.7.3, "Digital signatures" on page 110.
Generic RSA signatures	The Generic RSA engine uses a standard encryption algorithm that supports both the Microsoft and Netscape signature engines. The Generic RSA signature uses digital certificates from either your Microsoft Internet Explorer or your Netscape certificate store.
Entrust signatures	Entrust signatures are a type of digital signature (see 2.7.3, "Digital signatures" on page 110). Entrust signatures let the user sign the form using Entrust certificates.
Microsoft CryptoAPI signatures	Microsoft CryptoAPI signatures are a type of digital signature (see 2.7.3, "Digital signatures" on page 110). Microsoft CryptoAPI signatures use the Microsoft CryptoAPI signature engine. To use this type of digital signature, it is necessary for the user to obtain a digital certificate.

Electronic signature type	Description
Netscape signatures	Netscape signatures are a type of digital signature (see 2.7.3, "Digital signatures" on page 110). Netscape signatures use the Netscape encryption engine. To use this type of digital signature, it is necessary for the user to obtain a digital certificate. Netscape signatures use certificates located in the user's Netscape certificate store.
Signature Pad signatures	Signature pad signatures are a blending of electronic signatures and handwritten signatures. You write your signature on a digital pad that captures your handwriting and converts it into an electronic format. This signature is then added to the form, along with a graphic that shows the handwriting. Thus, Signature Pad signatures provide a familiar feel for the signing process.
Silanis signatures	Silanis Technology, Inc. provides a signature type that blends a digital signature and a signature pad signature. This means that an image of your signature is captured using a signature pad, but the actual signature is created using a digital certificate. The image of your handwritten signature is then stored as part of the digital signature for later reference. This combines the familiar pen-based signing process with the strength of digital certificates.
Clickwrap signatures	Clickwrap signatures are electronic signatures that do not require digital certificates. While they still offer a measure of security due to an encryption algorithm, Clickwrap signatures are not security tools.
Authenticated Clickwrap signatures	Authenticated Clickwrap signatures are a blending of Clickwrap and digital signatures. This enables users to securely sign a form without relying on an extended PKI infrastructure.

2.7.3 Digital signatures

Digital signatures are among the most secure electronic signatures. When you use digital signatures, each user is given a digital certificate. This certificate is actually a small file on a disk or on another device, such as a smart card. Each certificate also contains a unique code, and the certificate imprints this code on each signature you create with it. This means that all of your signatures can be traced back to your certificate, and the certificate itself can be traced back to you. In this way, digital signatures identify you through a clear chain of ownership.

Workplace Forms supports the following digital signature types:

- RSA standard signatures

  These signatures are based on the RSA standard for digital signatures. This is a public standard that is broadly supported by both Public Key Infrastructure (PKI) and browser vendors. Workplace Forms products rely on the security libraries in the Microsoft Internet Explorer and Netscape browsers to provide support for RSA signatures.

- Entrust signatures

  These signatures are based on a proprietary standard developed by Entrust, Inc. These signatures are not broadly supported, and require additional software from Entrust. This may take the form of client software or a central server that processes online signature requests.

In general, decisions about whether to use RSA signatures or Entrust signatures rely on individual preferences about their comparative strengths and features.

When to use digital signatures

Digital signatures are best used for controlled groups that require tight security. Remember that each user must receive a certificate, and further that each user must keep that certificate safe from theft and copying. This means that applications for the general public are not normally good candidates for digital signatures unless there is a large body already distributing certificates to the public (such as the government).

Digital signatures also incur significant overhead. To issue and track digital signatures, you need a Public Key Infrastructure (PKI), which can be costly and time consuming to maintain. In general, most organizations will not adopt this sort of system unless they have a strong security need (or are mandated through law). For example, military organizations or other government agencies might use digital signatures.

2.7.4 Signature filters

Occasionally, you may find that you do not want certain items or options to be signed. You may wish to create different form sections to be signed by different users, or you may want a custom item to continue working after the form is signed. You can accomplish this with signature filters.

Signature filters allow you to set which form elements you want to sign. There are two kinds of signature filters:

- Omit

  The *omit* filters let you specify the form elements that you do not want to sign, and ensure that the rest of the form is signed. This filter guarantees that everything in the form is secured, except the form elements that you choose.

- Keep

  The *keep* filters let you specify the form elements that you want to sign, leaving the rest of the form unsigned. This filter only secures the form elements that you choose, leaving the remainder of the form unprotected.

Note: Omit filters provide greater security than keep filters. It is good practice to use *omit* filters rather than *keep* filters. If you must use a keep filter, use it in conjunction with an omit filter. For example, you might want to omit the items in a “For office use only” section from a user’s signature, but you would secure the location and appearance of these items with a keep filter.

Workplace Forms Designer makes it easy to create secure signature filters. It allows you to select specific items that you want to omit from the signature, while automatically retaining item position information. This filter option, which is called *signitemrefs,* allows you to specify individual items that the signature will omit or keep. For example, you might set the filter to omit BUTTON1 on PAGE1.

The Designer also provides an interface that assists you in creating custom signature filters. Custom signature filters allow you to omit or keep specific form elements, such as:

- Items

  Specifies the types of items that the signature will omit or keep. For example, you might set the filter to omit all button items from the signature.

- Options

  Specifies the types of options that the signature will omit or keep. For example, you might set the filter to omit all *triggeritem options* from the signature.

- Groups

  Specifies one or more groups, as defined by the group option, that the signature will either omit or keep. This filters any radio buttons or cells belonging to that group, but does not filter list, pop-up, or combo box items. For example, if you had a pop-up containing a cell for each state, you might set the filter to omit the state group, which would omit all cells in that group.

- Data groups

  Specifies one or more data groups, as defined by the data group option, that the signature will either omit or keep. This filters data items belonging to that data group, but does not filter any action, button, or cell items. For example, if you had an enclosure button containing references, you might set a filter to omit the references data group, which would omit all data items in that group.

2.7.5 Creating multiple signatures

Forms often require multiple signatures. In fact, it is very common for some signatures to endorse other signatures. A combination of signatures is called overlapping signatures.

XFDL allows an unlimited number of signatures on a form. The signatures can sign separate and overlapping sections of the form, as well as endorsing other signatures, depending on the signature filters.

2.7.6 Create a Clickwrap signature button

In this section we discuss creating a Clickwrap signature button.

Creating Clickwrap signatures

Clickwrap signatures are electronic signatures that do not require digital certificates. While they offer a measure of security due to an encryption algorithm, Clickwrap signatures are not security tools. Instead, Clickwrap signatures offer a simple method of obtaining electronic evidence of user acceptance to an electronic agreement. The Clickwrap signing ceremony authenticates users through a series of questions and answers, and records the signer's consent. Clickwrap style agreements are frequently found in licensing agreements and other online transactions.

The simplest Clickwrap signing ceremony requests that users click the **Accept** button to sign a form. However, you can include a number of options in your Clickwrap signing ceremony. For example, you can add company information, the text of your agreement, questions and answers, and echo text. Echo text allows you to designate text that the user must re-type before signing the form. This ensures that the user has read vital information before indicating their agreement.

Restriction: A signature button can sign any XFDL, including panes and tables and the data to which their contained controls bind. You cannot place a signature button into a pane or table item's template (that is, the content of the xforms:group, xforms:repeat, or xforms:switch). Although this is possible to do in the Designer, this button will not function correctly in the Viewer.

To create a Clickwrap signature button in the employee information form:

1. We still have to keep in mind that the table in our form is dynamic, so we use relative alignment when positioning our button. Since the last few items on the form vary in height we can simplify the process and distinguish the button more clearly if we add a line to the form.
    a. Add a line to the form.
    b. Use relative alignment to place our new line below the lowest item on the form - LIST1 (Employee Type).
    c. Now use absolute expand to make the line equal in width to the main table pane.
    d. Relative align the left side of the line with the left side of the pane.
2. Select the **Button (Non-XForms)** item from the palette, as shown in Figure 2-83, and add it to the form.

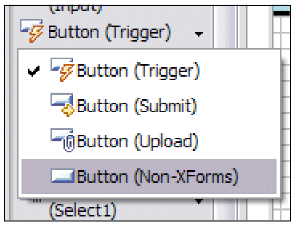


Figure 2-83 Add button to form

    a. Use relative alignment to position it below our new line.
    b. Use absolute expansion to make it the same width as the DatePickerItem.
3. Right-click the button and click **Wizards** → **Signature Wizard**, as shown in Figure 2-84.

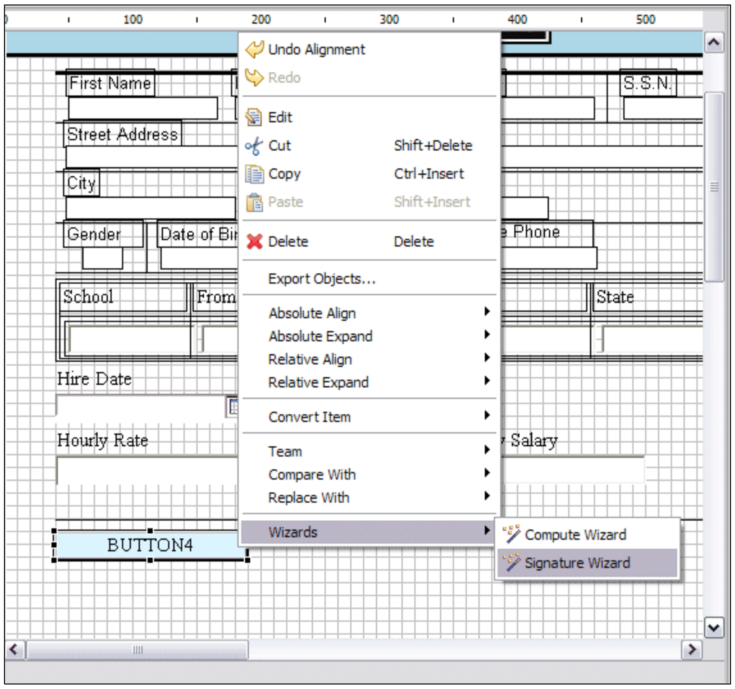


Figure 2-84 Access Signature Wizard

Restriction: The wizard does not provide the means to omit advanced elements of a form such as XForms Model instances. The Properties view or the Source editor must be used to define those filters.

Step 1 of the Signature Wizard interface

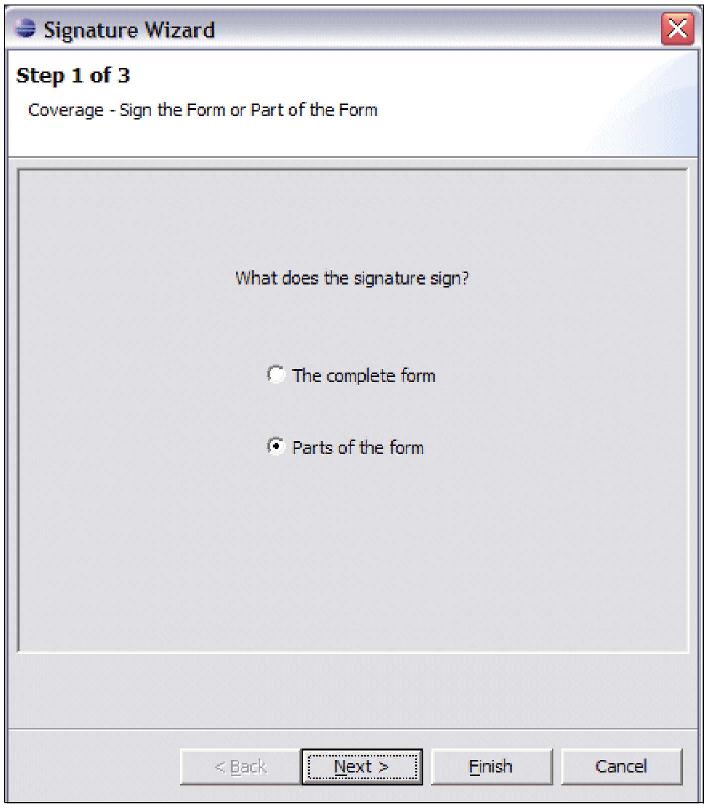
The process is:

1. A new window will open presenting you with the first of three pages in the wizard. There are two options here:
   - The complete form

     The signature button will sign the entire form.
   - Parts of the form

     The signature button will sign part of the form.

   The wizard is prompting us to specify whether a filter should be included in our signature button. Select **Parts of the form** to include a filter and click **Next**, as shown in Figure 2-85.


Signature Wizard

Step 1 of 3

Coverage - Sign the Form or Part of the Form

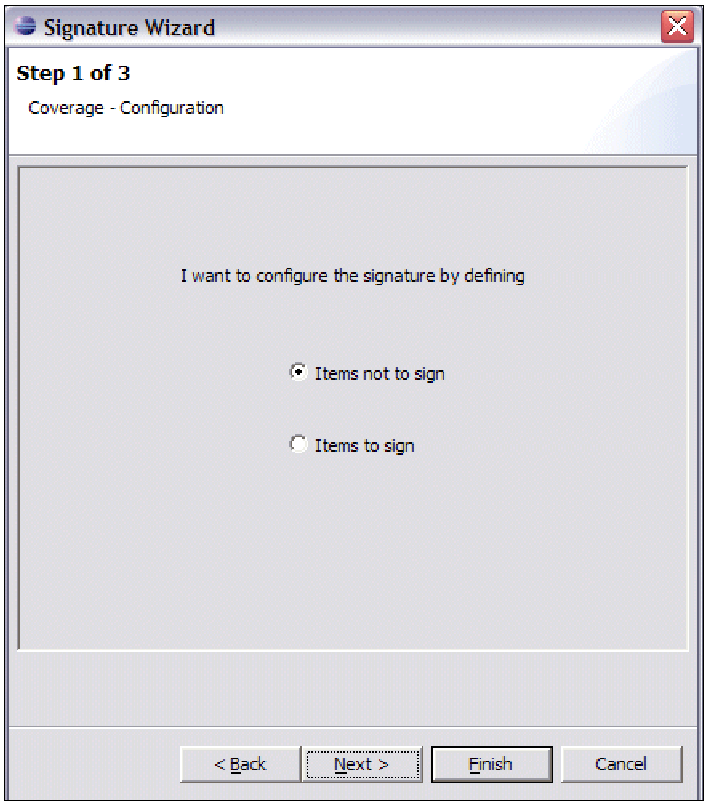
What does the signature sign?

( ) The complete form

[✓ Parts of the form]

Figure 2-85 Signature Wizard - step 1, page 1

2. On the next screen you will be asked whether you want to configure the signature by defining either items not to sign or items to sign. Since on the previous screen we specified that a filter was required, the wizard now asks what type of filter will be used for the signature button. Select the option for **Items not to sign** to specify an omit filter and click **Next**, as shown in Figure 2-86.


Signature Wizard

Step 1 of 3

Coverage - Configuration

I want to configure the signature by defining

(●) Items not to sign

( ) Items to sign

Figure 2-86 Signature Wizard - step 1, page 2

3. On the next screen you will be given the opportunity to select whole pages in the form that will not need to be signed. See Figure 2-87. Click **Next** to continue.

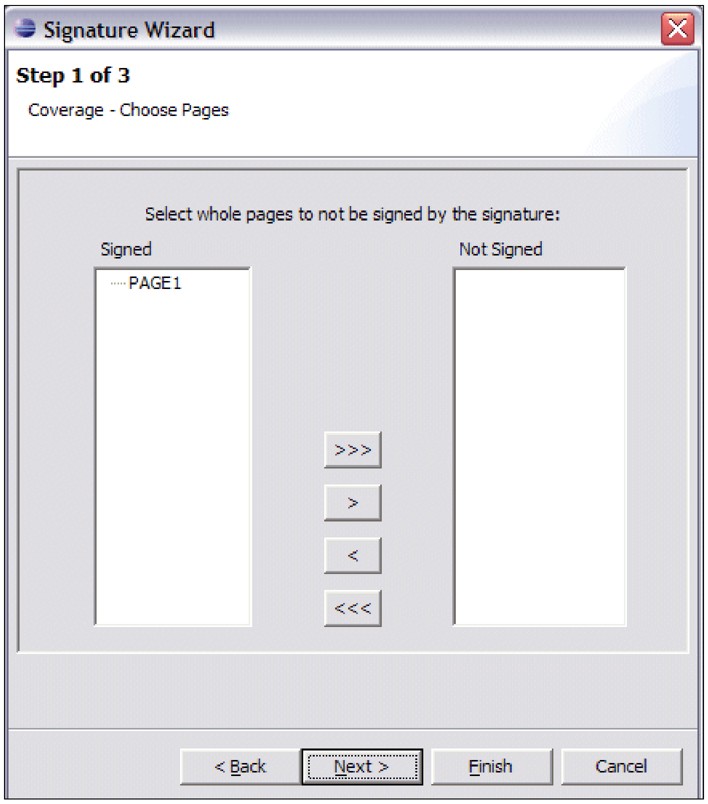


Figure 2-87 Signature Wizard - step 1, page 3

Note: Although there are circumstances where excluding an entire page from our signature may be useful, it will not be useful for our single page employee information form.

4. The next page prompts you to filter or omit individual items on the form. There are two approaches we can take here:
   – You can use the node explorer window to select items from the list shown in the Signed view of the screen and then add them to the Not Signed view on the right using the arrows shown between the two views.
   – You can use the hand icon to access the form and select items as displayed in the Design canvas. Often this is the easier of the two methods, especially for less advanced form developers.

Tips: If you plan to use the hand icon, keep these tips in mind:

- Hold down the Ctrl key and click to select multiple items on a page.
- If you inadvertently select an item that you want to sign, click it again to deselect that item.
- If you plan to use the hand icon to select items in the form, you should maximize the Designer canvas before starting the wizard. Otherwise you have to use the horizontal and vertical slides of the canvas to access all items on the form because the Designer perspective cannot be altered when the hand icon is activated.
- If you have an especially wide or long form you can show more of the form for the wizard by changing the zoom setting for the form. To zoom in or out you can use the drop-down list in the Designer toolbar, the View option from the menu of the Designer, or the respective key combinations: Ctrl+>, Ctrl+<.

Use the node explorer window to locate the FIELDYearlySalary item. Click the item and click the move item button (>) to add it to the list of items to be omitted from the signing ceremony. See Figure 2-88 for details.

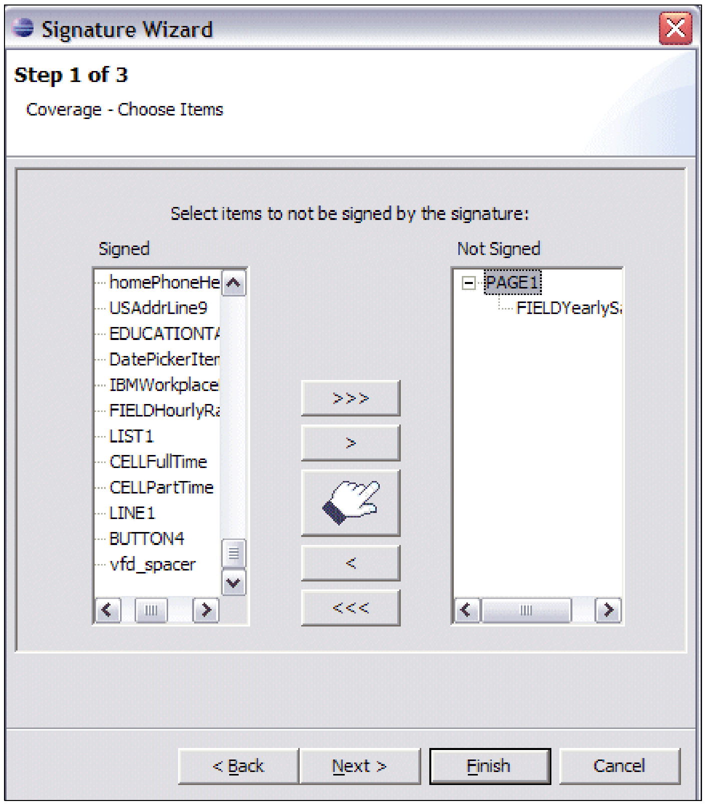
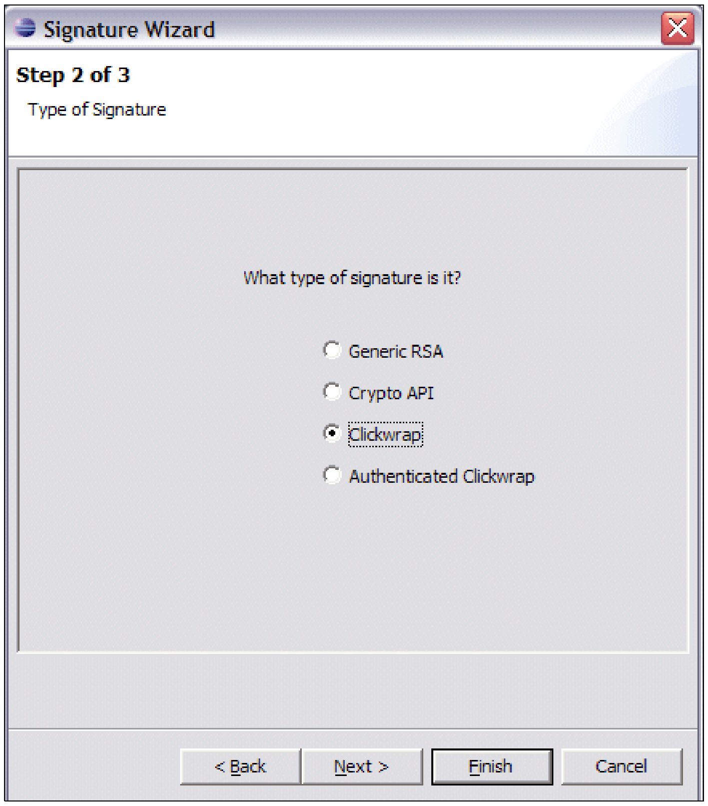


Figure 2-88 Signature Wizard - step 1, page 4

Step 1 is complete. We now move onto step 2 of the Signature Wizard.

Step 2 of the Signature Wizard

The is a single page step. On this page the wizard prompts for the type of signature to be used. Select **Clickwrap** as the type and click **Next**, as shown in Figure 2-89.


Signature Wizard

Step 2 of 3

Type of Signature

What type of signature is it?

- Generic RSA
- Crypto API
- [✓ Clickwrap]
- Authenticated Clickwrap

Figure 2-89 Signature Wizard - step 2, page 1

Step 3 of the Signature Wizard

For this step:

1. The first and only page of step 3 has the most options and is used to set the Clickwrap signature details. The field values entered here will be visible to the form user in the Clickwrap Signature Ceremony window. See Figure 2-90.

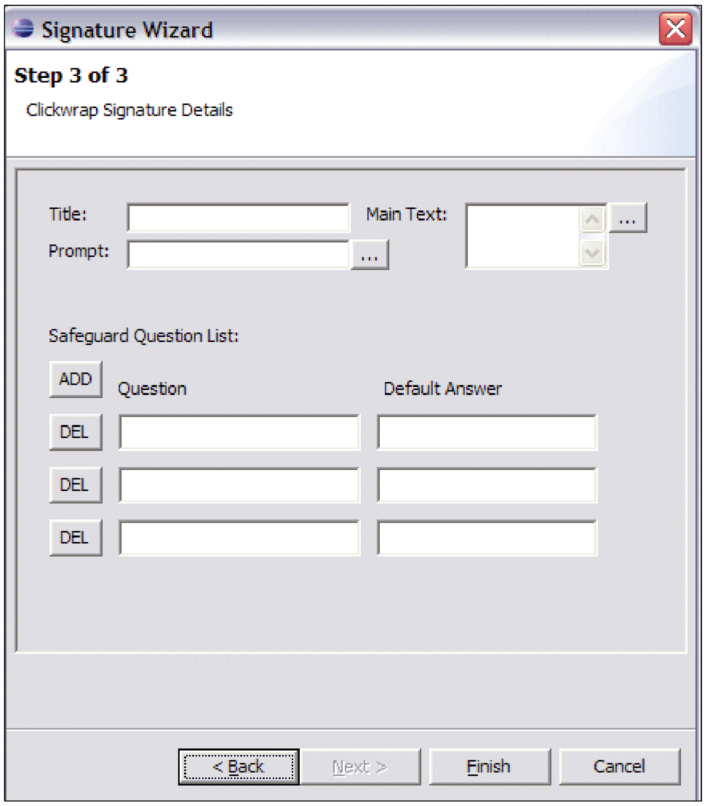


Figure 2-90 Signature Wizard - step 3, page 1

- Title

  The title of the signing ceremony. This text describes the signing ceremony, the company, or the title of the agreement. Enter `Click Wrap Signature` as the title.

- Prompt

  Typically used to explain the signing ceremony to users. Enter `Answer the following questions to authenticate...` as the prompt.

- Main Text

  Contains the main text of the agreement (for example, the text of a licensing agreement). You can add as much text as necessary to this parameter. The signing ceremony automatically displays scroll bars if the text is longer than the display field.

  Just as a proof point, enter some text here. (We copied and pasted the first section of the IBM Workplace Forms terms of use information.)

- Safeguard Question list section with:
  - Questions column

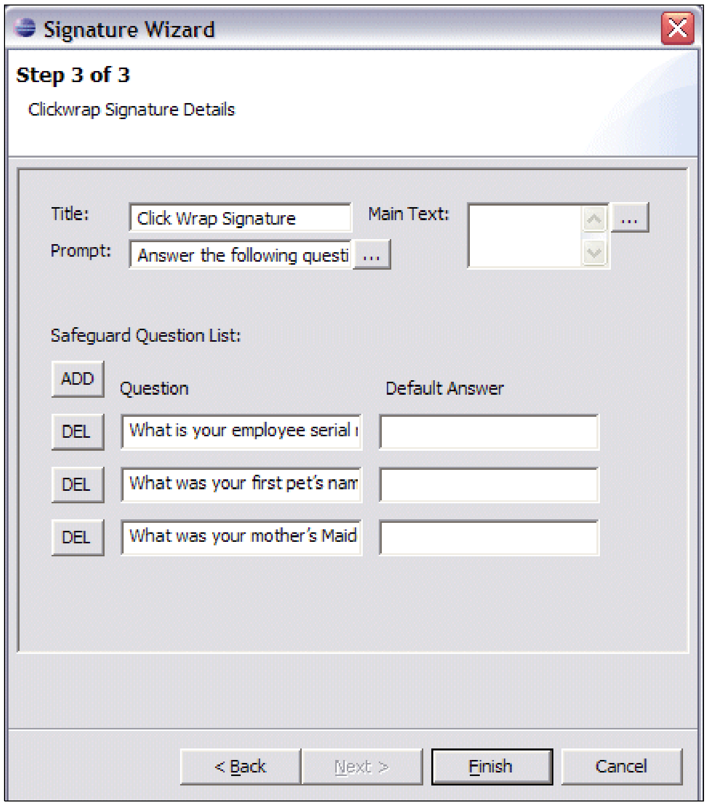
    Lets you prompt the user to ask from one to five questions that help establish the identity of the user.

By default there are three questions that we can add or remove from the list. We use all three. Enter the following questions in the existing fields: `What is your employee serial number? What was your first pet's name? What was your mother's Maiden Name?`

- Default Answer column

  These are the answers to the questions. To pre-populate the answer fields when the user signs the form, enter the answers here. Otherwise, you can leave these fields blank. Leave these fields blank.

When you have finished entering all of the values defined above, it should appear as shown in Figure 2-91.



Title: Click Wrap Signature

Prompt: Answer the following questi

Main Text:

Safeguard Question List:

Question	Default Answer
What is your employee serial n	
What was your first pet's nam	
What was your mother's Maid	

Figure 2-91 Signature Wizard complete

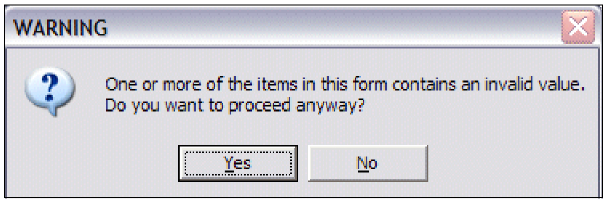
2. Click **Finish** to exit the wizard.

Preview the form

The basic behavior for our signature button has been created through the use of the wizard. We now have a functional signature button. To test its behavior click the **Preview** tab located in the bottom left corner of the Designer canvas.

Attention: The button label is no longer visible. This is because the wizard logic has replaced the original value/function. We resolve this issue later in this section.

When the form loads completely, click the Signature button without filling in any other field values. You will immediately see a warning message, as shown in Figure 2-92.

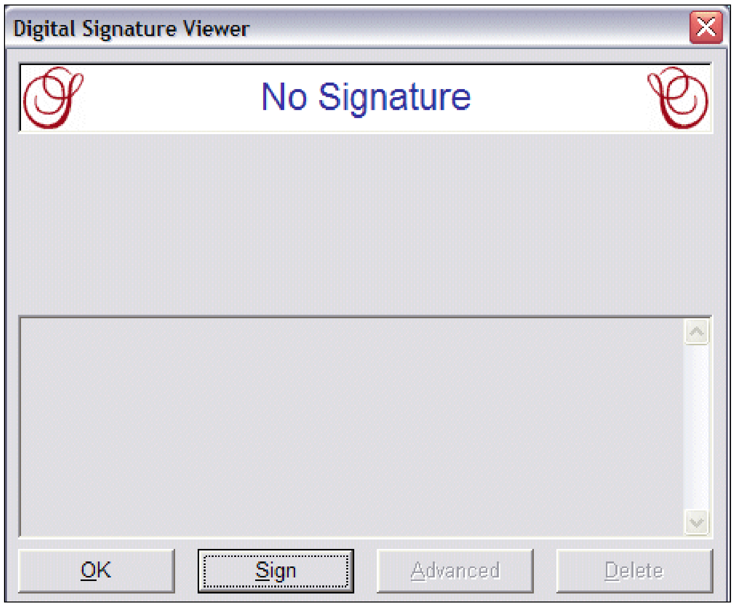

WARNING

One or more of the items in this form contains an invalid value.
Do you want to proceed anyway?

Figure 2-92 Warning message

Since this is just a warning, it can be ignored. However, you can design a form so that a signature button cannot be used until all mandatory fields are properly completed. For now click **Yes** to ignore it.

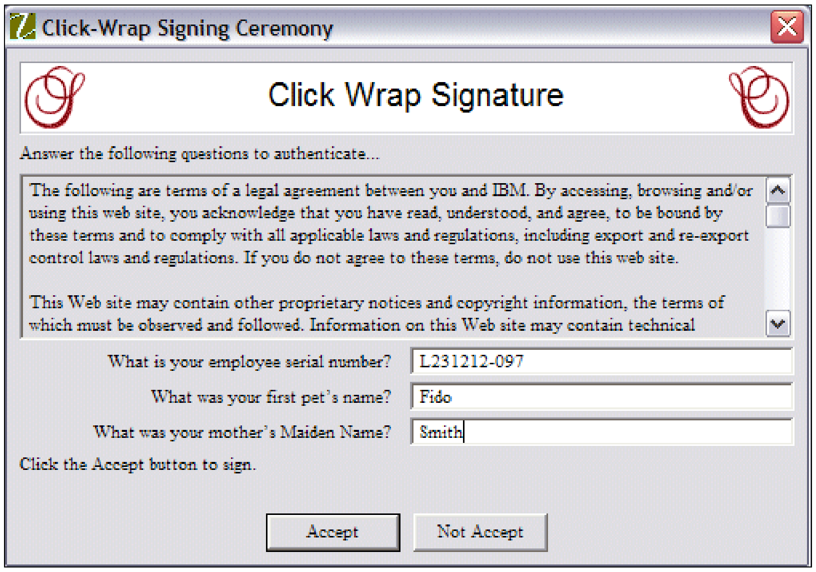
The Digital Signature Viewer will launch, as shown in Figure 2-93. If you click **OK** then the Digital Signature Viewer will close, and you will be returned to the form.


Digital Signature Viewer

No Signature

Figure 2-93 Digital Signature Viewer

Click the **Sign** button to take the next step towards completing the signing process. Another window will open. This is the Click-Wrap Signing Ceremony window. Notice that it shows all of the properties we defined in stage 3 of the Signature Wizard. Take a minute to examine this window and provide answers to the three questions shown in Figure 2-94.



Answer the following questions to authenticate...

The following are terms of a legal agreement between you and IBM. By accessing, browsing and/or using this web site, you acknowledge that you have read, understood, and agree, to be bound by these terms and to comply with all applicable laws and regulations, including export and re-export control laws and regulations. If you do not agree to these terms, do not use this web site.

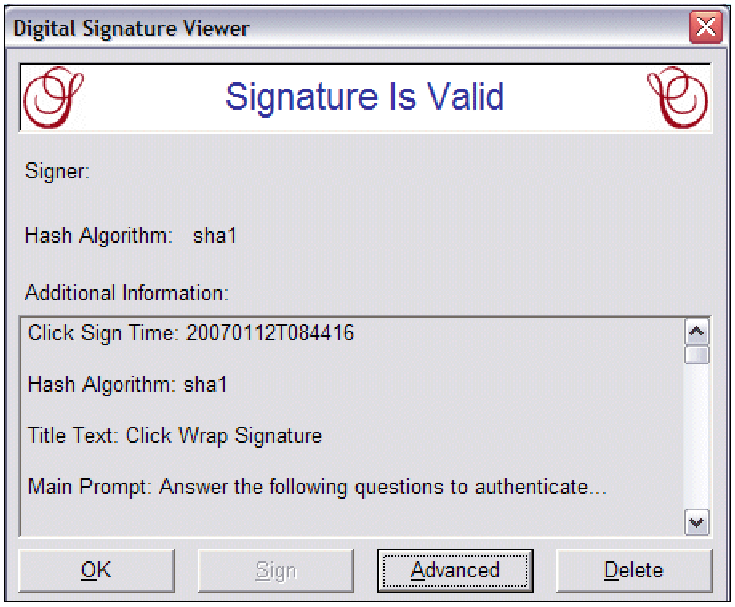
This Web site may contain other proprietary notices and copyright information, the terms of which must be observed and followed. Information on this Web site may contain technical

What is your employee serial number?	L231212-097
What was your first pet's name?	Fido
What was your mother's Maiden Name?	Smith

Click the Accept button to sign.

Figure 2-94 Click-Wrap Signing Ceremony

Click **Accept** when finished. You will be returned to the Digital Signature Viewer. Notice that the Viewer items have been updated to capture the values returned from the ceremony, as shown in Figure 2-95.



Signer:

Hash Algorithm: sha1

Additional Information:

Click Sign Time: 20070112T084416

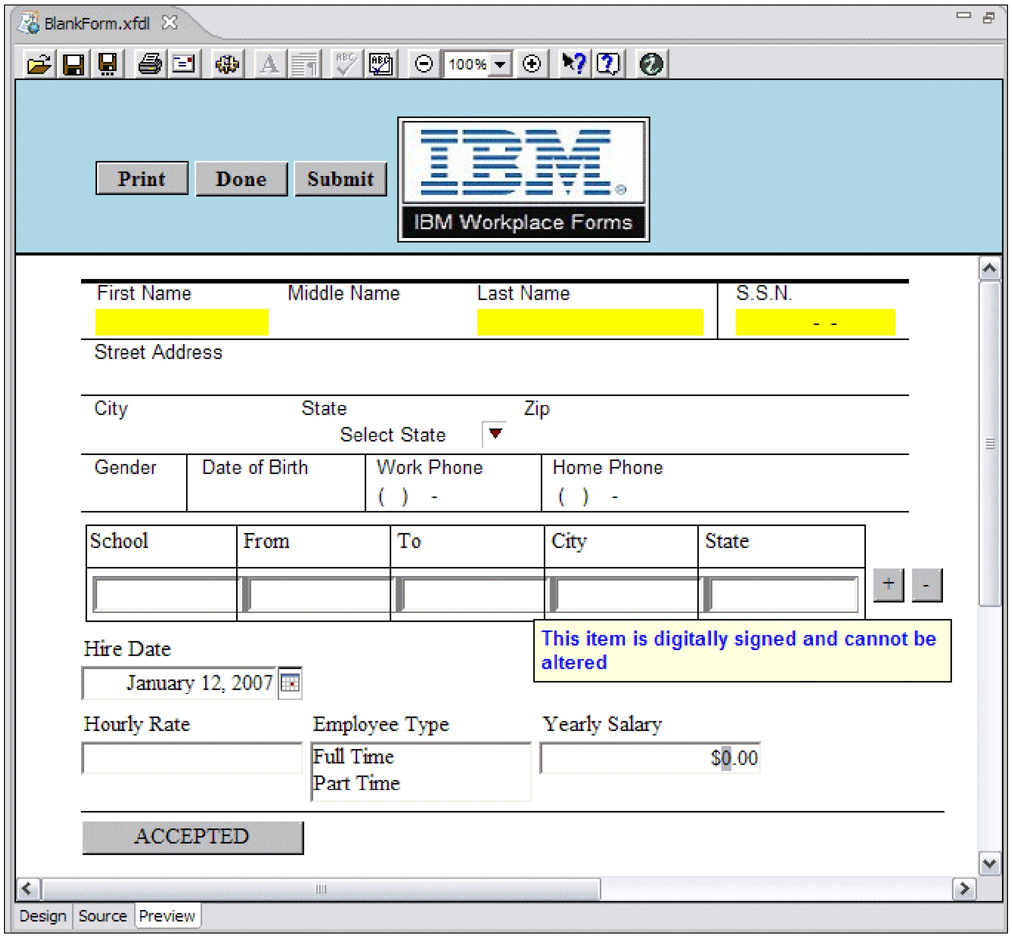
Hash Algorithm: sha1

Title Text: Click Wrap Signature

Main Prompt: Answer the following questions to authenticate...

Figure 2-95 Return to Signature Viewer

Click **OK** to return to the form preview. Move your mouse over all of the items on the form. Notice that every item except the Read-only Yearly Salary field has been locked, as shown in Figure 2-96.



First Name | Middle Name | Last Name | S.S.N. - -

Street Address

City | State: Select State | Zip

Gender | Date of Birth | Work Phone ( ) - | Home Phone ( ) -

School	From	To	City	State

This item is digitally signed and cannot be altered

Hire Date: January 12, 2007

Hourly Rate | Employee Type: Full Time / Part Time | Yearly Salary: $0.00

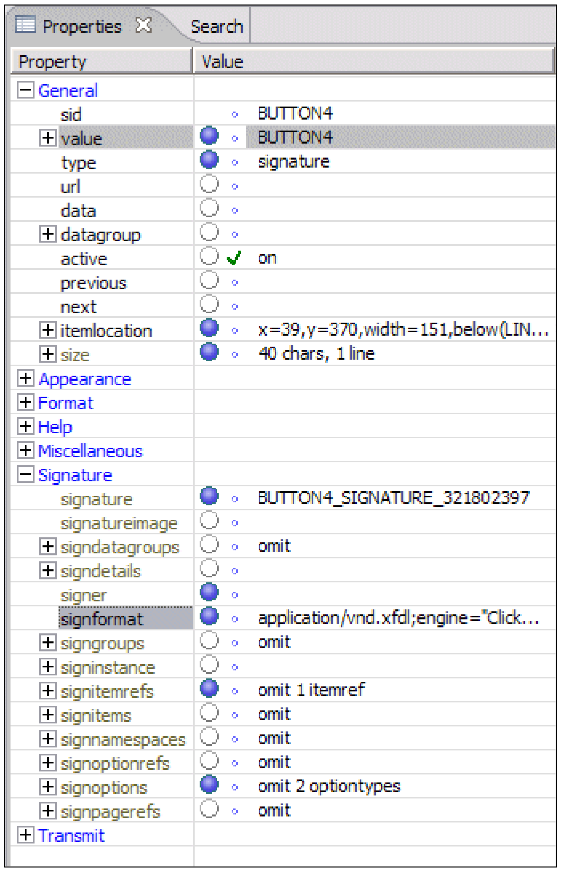
ACCEPTED

Figure 2-96 Form locked with digital signature

Notice also that the signature button now has a label. Where it was blank earlier, it has been updated to reflect the fact that the form has been accepted.

Additional signature button properties

There are additional more advanced properties for signature buttons. Like all other items in IBM Workplace Forms, properties for a signature button can be directly seen and modified in the Properties view. Let us look at the advanced signature properties of our button in Figure 2-97.



Property		Value
⊟ General		
sid		BUTTON4
⊞ value	●	BUTTON4
type	●	signature
url	○	
data	○	
⊞ datagroup	○	
active	○ ✓	on
previous	○	
next	○	
⊞ itemlocation	●	x=39,y=370,width=151,below(LIN...
⊞ size	●	40 chars, 1 line
⊞ Appearance		
⊞ Format		
⊞ Help		
⊞ Miscellaneous		
⊟ Signature		
signature	●	BUTTON4_SIGNATURE_321802397
signatureimage	○	
⊞ signdatagroups	○	omit
⊞ signdetails	○	
signer	●	
signformat	●	application/vnd.xfdl;engine="Click...
⊞ signgroups	○	omit
⊞ signinstance	○	
⊞ signitemrefs	●	omit 1 itemref
⊞ signitems	○	omit
⊞ signnamespaces	○	omit
⊞ signoptionrefs	○	omit
⊞ signoptions	●	omit 2 optiontypes
⊞ signpagerefs	○	omit
⊞ Transmit		

Figure 2-97 Signature button properties

Prevent the signature from being removed

By default, the user can delete a signature after signing a form. If you want to prevent users from deleting the signature, do the following:

1. Click the **Properties** view and click the down arrow button.
2. Click **Show Advanced Properties**.
3. In the Properties view, expand the **Signature** section.
4. Go to the signformat property. The value there reflects many of the properties that were defined in the wizard screens, as shown in Example 2-19.

Example 2-19 signformat properties

```
application/vnd.xfdl;engine="ClickWrap";titleText="Click Wrap
Signature";mainPrompt="Answer the following questions to
authenticate...";mainText="The following are terms of a legal agreement between
you and IBM. By accessing, browsing and/or using this web site, you acknowledge
that you have read, understood, and agree...
.
.
```

```
.
...";question1Text="What is your employee serial
number?";answer1Text="";question2Text="What was your first pet's
name?";answer2Text="";question3Text="What was your mother's Maiden
Name?";answer3Text=""
```

5. Add the following text to the end of the current signformat value:

   `;delete="off"`

After making this change form user will not be able to remove a signature. Once it has been signed, there can be no more changes to any of the items that were not filtered out of the signature process.

If you want to customize the signature button further, the following attributes of the signformat property are available in the Advanced view of the button. Using the method described in the prior section, you can modify these properties:

- echoPrompt: Use this to instruct the user to echo the echoText. Generally, if you include echoText, you might want to include the text:

  `Please type the following phrase to show that you understand and agree to this contract.`

- echoText: This is the actual text that the user should echo, or re-type. For example:

  `I understand the terms of this agreement.`

- buttonPrompt: This is an instruction line that appears above the Accept and Reject buttons. The user must click the Accept button to sign, so the prompt might read:

  `Click Accept to sign this document.`

  The default setting is `Click the Accept button to sign`.

- acceptText: sets the text that the Accept button displays. The default text is `Accept`.
- rejectText: sets the text that the Reject button displays. The default text is `Not Accept`.

2.8 Workplace Forms Viewer

In this section we cover the following topics:

- Introduction
- Viewer modes
- Toolbar buttons
- Input validation
- Recognizing mandatory items
- Completing Formatted fields
- Turning on help messages
- Opening the Viewer help form

2.8.1 Introduction

Workplace Forms Viewer is a client-side application that is installed on the end-user's system. It draws the visual form based on the XFDL source code, which provides a single interface for users to open, review, or complete XFDL forms. One of the most important functions of the view is its ability to enforce and maintain the internal logic of the form. Additionally, the Viewer is interactive. While users complete forms, the Viewer responds to user input.

2.8.2 Viewer modes

The Viewer has two modes:

- Standalone
- Browser interface

Both modes have full online and offline functionality. Figure 2-98 shows the Workplace Forms Viewer interface.

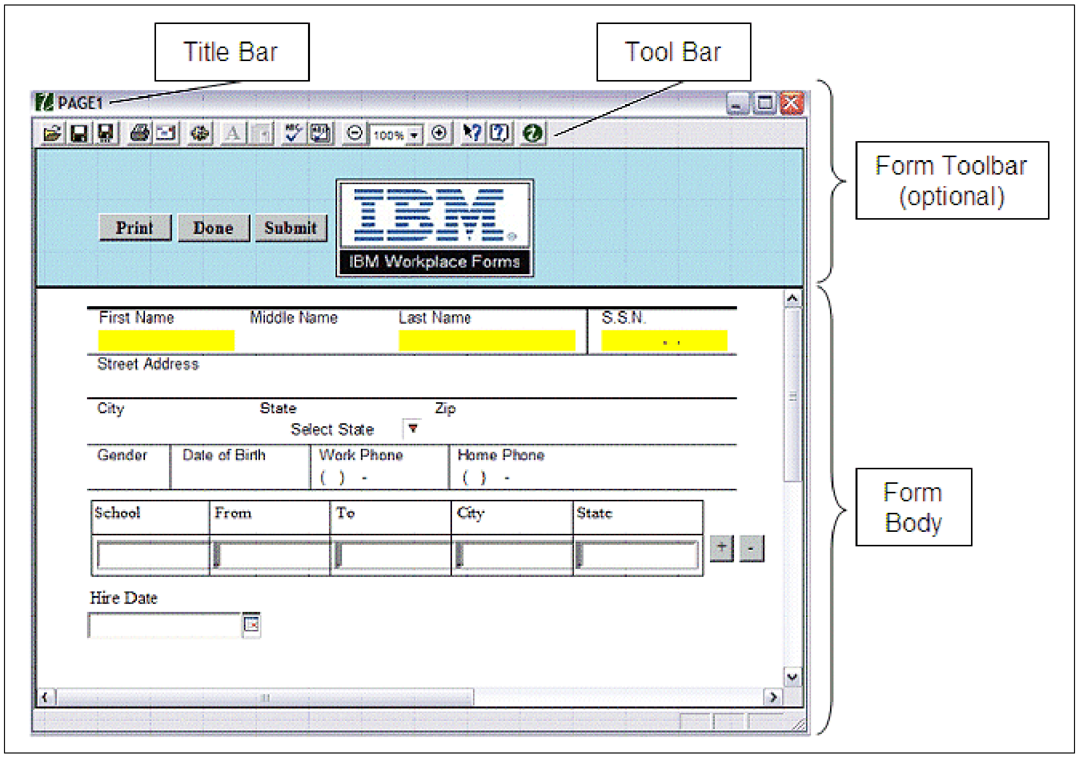


Figure 2-98 Workplace Forms Viewer interface

2.8.3 Toolbar buttons

There are several toolbar buttons available in the IBM Workplace Forms Viewer. They are shown in Figure 2-99.

Font controls (rich text only)
Paragraph controls (rich text only)
Check spelling (user input - current item)
Check spelling (user input - all items on page)
Zoom out
Zoom in

Figure 2-99 Viewer button list 1

The remaining buttons are shown in Figure 2-100.

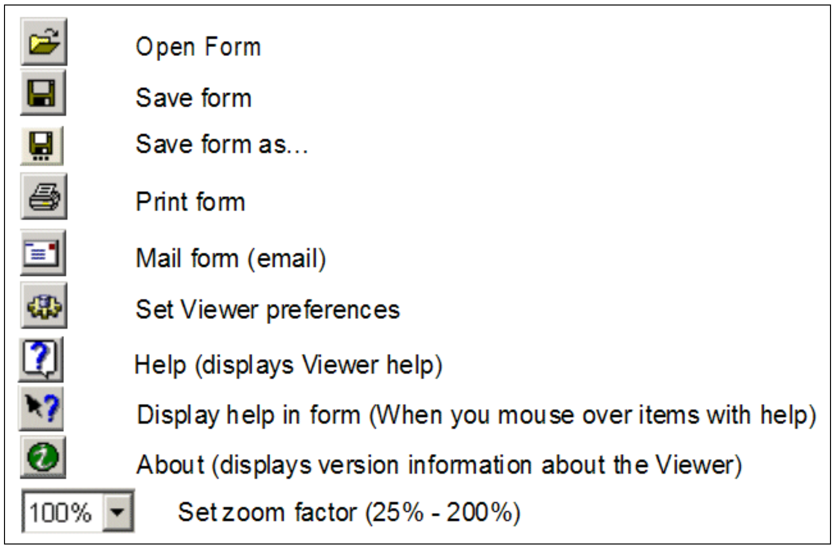

Open Form
Save form
Save form as...
Print form
Mail form (email)
Set Viewer preferences
Help (displays Viewer help)
Display help in form (When you mouse over items with help)
About (displays version information about the Viewer)
100%
Set zoom factor (25% - 200%)

Figure 2-100 Viewer buttons list 2

2.8.4 Input validation

The Workplace Forms Viewer can perform real-time consistency checks and formatting of the data entered by the user while the fields in the form are being filled. This assures that the data entered is always in the correct format for its further purpose in a back-end system or application. You can configure the following format properties for the data contained in the fields. See Table 2-13. For more details about the properties shown on the table below, please refer to the *Workplace Forms Designer V2.6.1 User's Guide*.

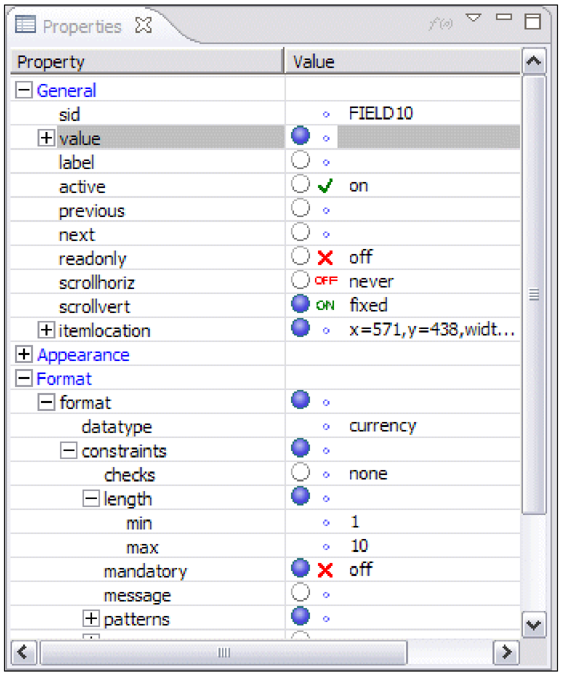
Table 2-13 Properties for formatting input data

Format	Description
Data type	Specifies what type of input to accept: date_time, currency, float, integer, month, string, time, void, year, date, day_of_week, or day_of_month.
Strings	For a datatype set to string, set *casetype* to one of the following: lower, upper, title.

Format	Description
Numbers and currency	For a datatype set to integer, float, or currency, set any of the following: ► groupingseparator - the symbols used to separate groups of numbers. The default for the en_US locale is a comma. ► negativeindicator - sets the symbols that are used to indicate a negative value. The default for the en_US locale is a minus sign (-). ► round - determines how values are rounded. Valid settings are floor, ceiling, up, down, and half_even (which is the default value). ► pad - sets the number of digits to show, regardless of the value. The default is 0 (no padding imposed). ► padcharacter - sets the character to use for padding. The default for the en_US locale is 0. ► fractiondigits - sets the number of digits shown after the decimal place. It is only valid for float and currency data types. ► significantdigits - sets the number of significant digits allowed. ► pattern - allows you to set a pattern for number and date data types. ► decimalseparator - defines one or more symbols that are allowed to indicate the decimal place.
Dates	For a datatype set to date_time, month, year, date, day_of_week. or day_of_month, set *style* to: numeric, short, medium, long, or full.
Constraints on user input	XFDL input items can be set up to accept only input formatted within certain constraints. The following is a list of constraints that can be applied to items: ► checks - This allows you to force the format check to fail, or to ignore all contraints settings. ► mandatory - The user is required to fill in data before proceeding. ► range - The entry must fall within the range you specify. ► length - The number of characters in the entry must fall within the limits you specify. ► patterns - This allows you to set one or more patters for strings, dates, or numbers that are valid as input. ► message - This sets the message that is displayed when the input is invalid. ► template - This allows you to display symbols in the input area before the user enters their data. ► groupingseparator - This defines one or more symbols that are allowed to separate groups of numbers during input. ► decimalseparator - This defines one or more symbols that are allowed to indicate the decimal place.

As an example, we formatted the price and amount with the following properties, as shown in Figure 2-101:

- Set the datatype property to currency.
- In the length property, set the min to 1 and the max to 10.



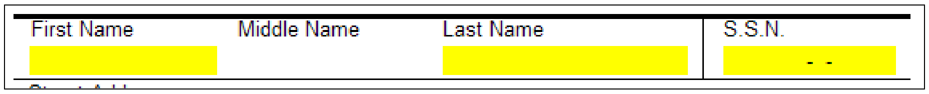
Properties

Property	Value
⊟ General	
sid	FIELD10
⊞ value	
label	
active	✓ on
previous	
next	
readonly	✗ off
scrollhoriz	OFF never
scrollvert	ON fixed
⊞ itemlocation	x=571,y=438,widt...
⊞ Appearance	
⊟ Format	
⊟ format	
datatype	currency
⊟ constraints	
checks	none
⊟ length	
min	1
max	10
mandatory	✗ off
message	
⊞ patterns	

Figure 2-101 Field Format Properties view

2.8.5 Recognizing mandatory items

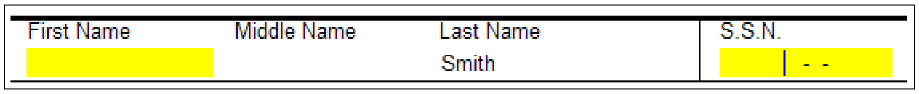
Forms are often used to collect important information. As a result, a form may contain fields or other items that you must complete before saving or submitting a form. If you launch the employee information form you can identify these items by their yellow background color, as shown in Figure 2-102.



First Name	Middle Name	Last Name	S.S.N.
			- -

Figure 2-102 Mandatory items

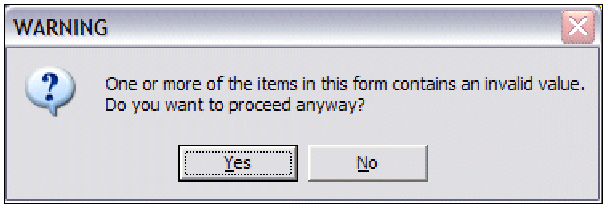
The yellow background disappears as soon as you complete the item. For example, try typing a last name into the Last Name field and then pressing Tab to leave the field. Notice that the field is no longer highlighted, as shown in Example 2-103.



First Name	Middle Name	Last Name	S.S.N.
		Smith	- -

Figure 2-103 Fill in Last Name field

If you try to print, save, sign, or submit a form without completing a mandatory item, the Viewer will display a warning message asking you to confirm that you want perform the action without completing the form. See Figure 2-104.


WARNING

One or more of the items in this form contains an invalid value.
Do you want to proceed anyway?

Figure 2-104 Warning message

If you are printing or saving the form for your own use, click **Yes** to continue. However, if you are submitting a form to a database, or signing it to indicate your acceptance of the contents, you should make sure that all mandatory items are complete before continuing.

2.8.6 Completing Formatted fields

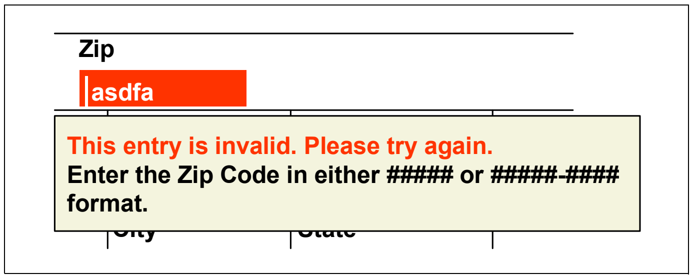
Filling out Workplace Forms is similar to filling out paper forms except that you use the mouse and the keyboard to enter your information. For example, you type text into fields and select check boxes by clicking them with the mouse. On the form, move from item to item by pressing the Tab key or use the mouse to reposition the cursor.

Some fields contain special formatting that check to make sure that you are entering the correct information. For example, some fields might only accept dates or numbers. If you return to the employee information form you will notice that there are several formatted fields:

- Social security number
- Home phone
- Work phone
- Zip code

Formatted fields help you to enter the correct information. Take zip code, for example. It requires either a five-digit number, or five digits, a hyphen, and four more digits. If we attempt to enter an obviously wrong value such as five letters, then when we tab out of the field we are immediately notified with the following (see Figure 2-105):

- The form beeps.
- The field turns red.
- A hint box appears with specific information telling you what is required.


Zip

asdfa

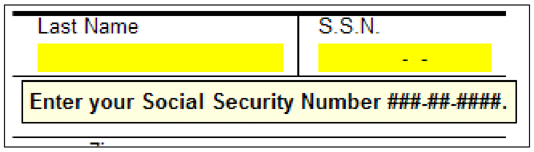
This entry is invalid. Please try again.
Enter the Zip Code in either ##### or #####-#### format.

Figure 2-105 Invalid format

The field will only return to normal if you enter a valid zip code. Enter five digits and tab out of the field. The issue has been resolved.

2.8.7 Turning on help messages

Many forms contain help messages that aid you in completing the form. They appear as little floating tips when you tab into or click an item with help. For example, Figure 2-106 shows the SSN field. The help provides you with a full description and a symbolic representation of the format required for a Social Security Number.



Enter your Social Security Number ###-##-####.

Figure 2-106 Mouse over help

Before you can see these helpful tips, you must turn help mode on. You can do this by clicking the Help Mode icon in the Viewer toolbar. If this button is greyed out or unavailable, then the form does not contain any help messages.

2.8.8 Opening the Viewer help form

The Viewer help form provides additional help information. It contains a list of keyboard commands that will help you control the Viewer and complete your forms. It also provides accessibility information for people who have difficulty viewing the form.

To open the Viewer help form, click the Viewer Help icon.

3

XForms

This chapter provides an overview of the W3C XForms Specification and discusses how it is implemented in IBM Workplace Forms today. Once we have provided a solid overview of the specification, we provide more information about how forms with XForms support are processed and how they can participate in the SOA.

In this chapter we consider the following topics:

- Introduction to XForms
- What is new to IBM Workplace Forms with XForms support
- Workplace Forms: XForms and XFDL
- Processing e-forms with XForms objects
- XForms and SOA

3.1 Introduction to XForms

The World Wide Web Consortium (W3C) developed the XForms specification as a major revision to Web forms and is considered by many to be the *next generation of Web forms*. The creation of this specification began in 2000 and was driven by a need to provide more dynamic forms, which could be created more quickly and easily. Additionally, XForms provides the means to create items and data models that can be reused across multiple forms.

The technology was six years in development. It first became a W3C recommendation in 2003, and on March 14, 2006, a significant refinement was released — the second edition of the XForms 1.0 specification. IBM, along with other vendors, is a member of the W3C XForms working group that contributes to the development of Version 1.1 of this specification. IBM Workplace Forms 2.6.1 provides support for Version 1.0 with select features from Version 1.1.

XML is a common language for representing data processing models. One of the goals of XML is to enable inter-operation of applications by representing data in a standard, human-readable format that is also well suited for processing by a computer.

XForms is an XML vocabulary that provides the ability to wrap, or skin, XML data with a processing model, including:

- Dynamically recalculated computes that express relationships in data and their properties
- Static constraints expressed via XML schema constructs
- Dynamic constraints that are automatically rechecked as data changes
- Parameters for submitting XML data
- Event-triggered action sequences that manipulate data in response to user actions

3.2 XForms and SOA

In this section we discuss XForms and SOA.

Enhances and complements SOA

Standardization of a forms data processing model enables reusable components that integrate with SOA enabling faster time-to-market with lower form application deployment and maintenance costs.

By exploiting the reusability inherent with XForms and the capability of requesting and utilizing services available in enterprise applications, IBM Workplace Forms is a strong participant in SOA architecture. XFDL + XForms provides us with an enabler for service-oriented e-form solutions. Strong technical alignment reduces barriers. See Figure 3-1.

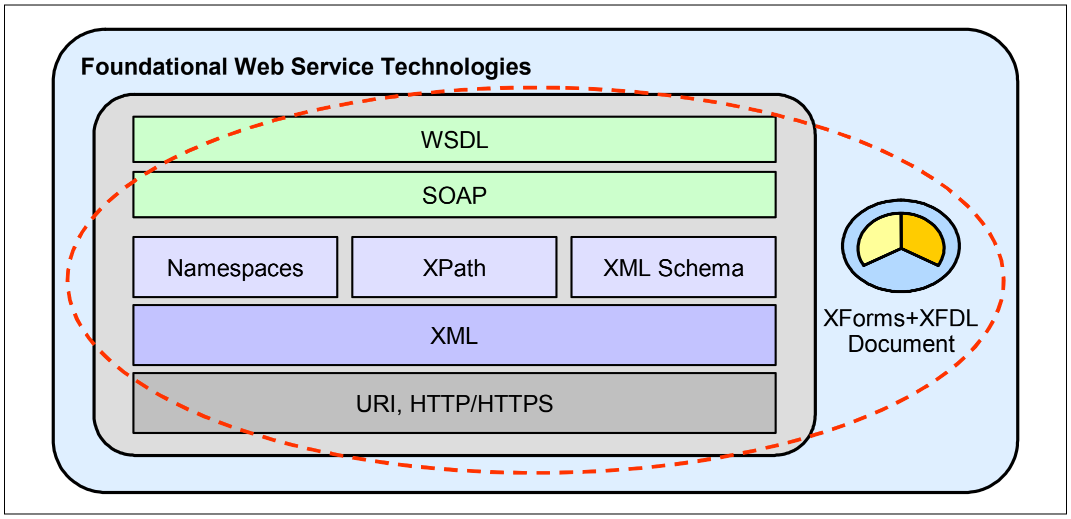


Figure 3-1 XForms and SOA

The Workplace Forms Designer helps us by generating much of the markup needed for Enterprise e-forms.

3.3 What is XForms

The XForms specification provides a predefined set of tags, elements, and attributes that ease the creation of Web forms. XForms splits a form's data model, view, and controller. These parts are further decomposed into even finer reusable levels. See Figure 3-2.

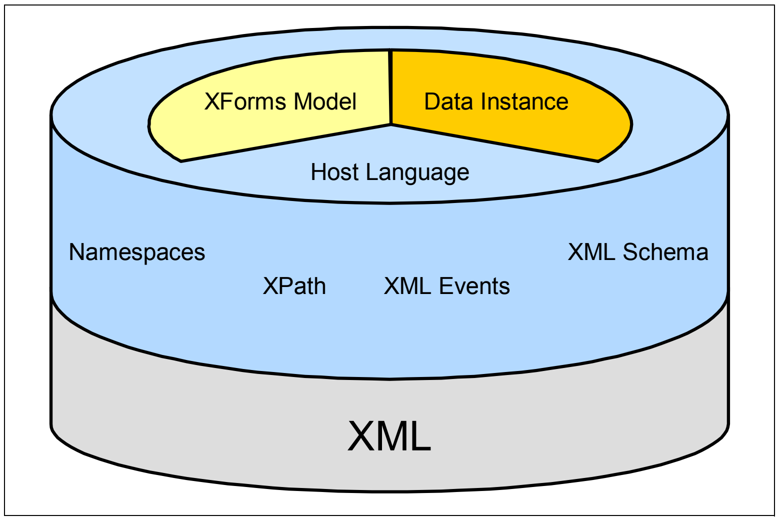


Figure 3-2 XForms Model

The data model part of XForms enables you to declare data items and structure separate from any set of design items that may be used to display the data values such as a text field on a form. Furthermore, XForms defines the means to link these data items to the presentation layer separately from the declaration of the data model itself. Lastly, it provides a declarative means to act upon changes of value with any particular data item defined within the XForms Model.

However, XForms is not a stand-alone language. It must be contained inside an XFDL or other presentation layer wrapper or skin that provides detailed presentation information for the form. Furthermore, individual XForms User Interface (UI) elements must be contained by individual items in the presentation layer.

3.4 Why support XForms

Many vendors, IBM included, have taken an active role in the XForms specification process and are actively exploring this emerging standard, as shown in Figure 3-3.

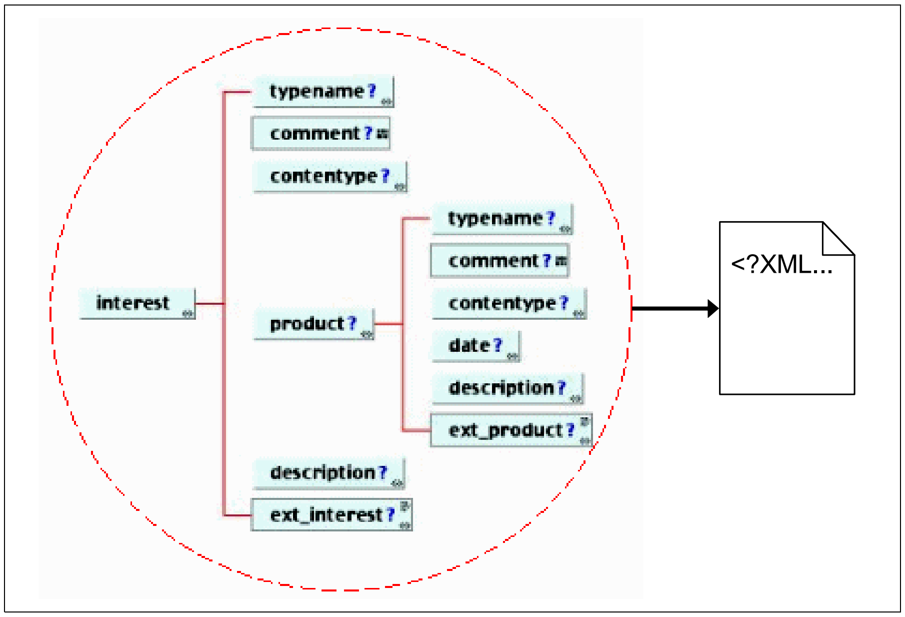


Figure 3-3 xForms data model diagram

One reason behind the strength of the XForms community is its broad applicability as a Web technology. XForms defines the core XML data processing asset, whether the data processing needs be simple or complex. It is designed to be connected to numerous host languages like XHTML, SVG, Voice XML, XSL-FO, and even XML vocabularies like XFDL (used on IBM Workplace Forms to provide a secure, high-precision presentation layer for XForms).

XForms widgets are abstract in nature, so different platforms can choose to implement them in different ways. For example, while a <radioButton> tag in HTML may have only one presentation across platforms (such as drop-down menu), the <select1> widget in XForms may result in a drop-down menu on a PC browser or a list of radio buttons on a PDA. The purpose of the <select1> control, however, remains the same — it affords a user the ability to select a single element from a set of items.

3.5 Understanding the XForms Model

The XForms Model is a block of XML data that contains three core parts that work together to create a complete model:

- Data instances: Data instances are arbitrary blocks of XML. A data model may contain any number of data instances, and each instance is normally created to serve a particular purpose.
- Binds: The data layer and the presentation layer are connected by binds.
- Submissions: Each data instance may have an associated set of submission rules. These rules control how a data instance is transmitted when it is submitted for processing. This is an optional feature, and is only necessary when you want to submit the data instance by itself, without the rest of the form. There are many cases in which you may want to submit

the entire form, and then retrieve the data instance from the form during processing. This is particularly true when you are using signatures on your forms.

Note: We recommend that a form contain only one XForms Model, but multiple models are allowed (though they have no ability to interact).

3.5.1 XForms data instances

An XForms data instance defines the XML template for the data that will be collected from the form. A data instance can be used to store input values, pre-populate fields with data, or dynamically generate list selections.

An XForms Model can have more than one data instance. For example, one data instance can contain user information for a submission while another data instance can contain user preference data. Additionally, you can link each data instance to a button on the form that will trigger the submission of that instance.

It is a good idea to create each data instance, along with its associated binds and submission rules following these steps:

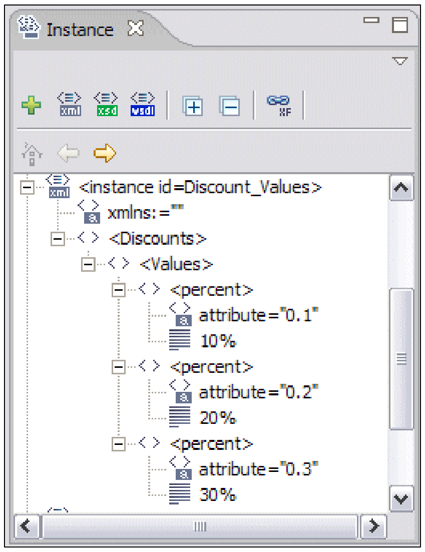
1. Create a data instance. The first stage is to create a data instance. In this stage, you model your data instance by adding elements, attributes, and text values to the data instance.
2. Bind the data instance to the form. The second stage is to bind the data instance to the form. This maps individual data elements to one or more user interface items, so that they share data.
3. Set the submission rules. Finally, you must define the submission rules for the instance if you intend to submit the data separately. These rules determine what data is selected and sets other submission-related properties.

3.5.2 Node

When working with XForms instances it is important to know the terminology used to describe its elements. The data instance's elements and attributes are collectively referred to as nodes. Since you will have to bind the form's user interface items to the various nodes in a data instance, it is important to understand node terminology.

Node terminology

The data instance shown in Figure 3-4 is used as an example to describe the various node types.


Instance

```
<instance id=Discount_Values>
  xmlns:=""
  <Discounts>
    <Values>
      <percent>
        attribute="0.1"
        10%
      <percent>
        attribute="0.2"
        20%
      <percent>
        attribute="0.3"
        30%
```

Figure 3-4 Instance view in the Designer

The node types are:

- Root node — The root node is the single node that contains all other nodes. You build your data instance by adding elements and attributes to the root node. A data instance can only have one root node. In the example, the root node is <Discounts>.
- Parent node — The parent node is an element that has other elements added to it. When a parent node contains more than one child element, it is also referred to as a node set. In the example, a parent node is <Values>.
- Child node — A child node is an element that is added to a parent element. In the example, <percent> is a child node of <Values>.
- Sibling node — When you add more than one child to a parent, each child node becomes a sibling node. You can add elements to a parent element as children or as siblings. In the example, a sibling node is <percent>.

  Note: Typically, you would only add a sibling element to the data instance if you forgot to add an element or the model has changed and needs to be updated.

- Attribute node — You can add attributes to an element. An attribute extends the functionality of an element and is typically used in the following circumstances:
  - You want to limit the size of data you will be storing.
  - You have a group of items that you want to present to the user as a list of items.
  - You want to submit additional data related to the data entered by the user. For example, you could add an attribute to hold a product ID that the user never sees but is submitted when the user picks the product.

  In the example shown in Figure 3-4, the attribute node was left with the default value of attribute.

Note: Node names cannot contain special characters (such as spaces, <, >, &, and so on.)

Node text values

A node can also have a text value.

- Element text value — You can add a text value to a child element. Once you bind an element that has a text value to a user interface item, the text value is displayed to the user in the bound user interface item.

  Note: Once you add a text value to an element, it can no longer be a parent node. In other words, you cannot add an element to an element that has a text value.

- Attribute text value — You can add a text value to an attribute. Once you bind an attribute that has a text value to a user interface item property, the text value is what will be submitted as the item's value property.

In the example shown in Figure 3-4 on page 139, the attribute text values are "0.1", "0.2", and "0.3". If "10%" is chosen by a user from the discount list, "0.1" is submitted as the node value instead of "10%".

3.6 What is new to IBM Workplace Forms with XForms support

With the introduction of XForms support, new features and functions have been added to IBM Workplace Forms. These include:

- XForms Items
- XForms Event Handlers
- XForms Functions
- XForms Device Independence

3.6.1 XForms items

XForms items are required when you are creating an XFDL form that contains an XForms data model. These items are used to contain XForms constructs that do not normally exist in XFDL, such as tables and checkgroups that automatically repeat elements based on the structure of the data model. XForms items follow the same syntax rules as XFDL items. Below are a few examples.

Table

This creates a traditional table of repeated items organized into rows. This is accomplished by creating a template row that includes all of the items that should appear in each row. This row is then linked to the XForms data model.

Each time a new row is added to the table, the template items are duplicated to create the new row. This occurs when the elements in the data model that are linked to those items are duplicated. This allows the table to expand to any size while ensuring that data for each row in the table is still maintained in the data model.

The template row is created within an xforms:repeat option. This option is used to group the items that create the template row, and also links the row to particular portion of the data model. The template items can be configured with any location relative to one another. This means that they need not appear in horizontal succession. The current implementation of the XForms table limits the dynamic expansion of the table to rows, but not columns.

Pane

A pane is used to contain one of the following:

- A group of items that can be positioned or made visible as a unit, and that can be given a common border or background.
- A switch, which allows you to group items into sets, and then display one set of items at a time to the user.
- Be a logical grouping (for instance, address data).

The pane itself can also have a physical appearance, such as a border or a different background color, that visually groups the items for the user.

checkgroup

Creates a group of check boxes. This is useful if you want to create a list of options and allow the user to select some of them. You can configure a checkgroup to allow only one selection, or to allow the user to select one or more of the choices. If desired, you can also configure a checkgroup to allow the user to select only one choice.

Each check box appears as an empty box that is filled with a marker, such as a check mark or an X, when selected.

Radio group

This creates a group of radio buttons. This is useful if you want to create a list of options from which the user may select only one choice. Each radio button appears as an empty circle that is filled with a marker, such as a dot, when selected.

3.6.2 XForms event handlers

XForms event handlers track events in the form, such as a button click or the selection of a particular choice. When these events occur, they are registered by the XForms system. This allows you to create actions that are triggered by these events. For example, you might create an action that is triggered when a particular button is clicked, or when a particular choice in a list is selected. A few examples follow:

value-changed

This occurs when a value changes in an XForms item (an XFDL item that is linked to the XForms Model).

submit-done

This occurs when an XForms submission has successfully completed.

ready

This occurs when the forms viewing application has finished the initial set up of all XForms constructs and is ready for user interaction.

submit-error, and so on

This occurs when an XForms submission returns an error.

3.6.3 XForms functions

A few examples follow.

boolean from string

This converts a string to a boolean value. This is useful for converting string content, such as content from an instance data node, to a boolean result, which is required to set some of the properties on data elements, such as relevant and readonly.

avg

This averages the values for a set of nodes. The strings values of the nodes are converted to numbers, added together, and then divided by the number of nodes.

min

This determines the minimum value from a set of nodes. The string value of each node is converted to a number, then the minimum value is determined.

max

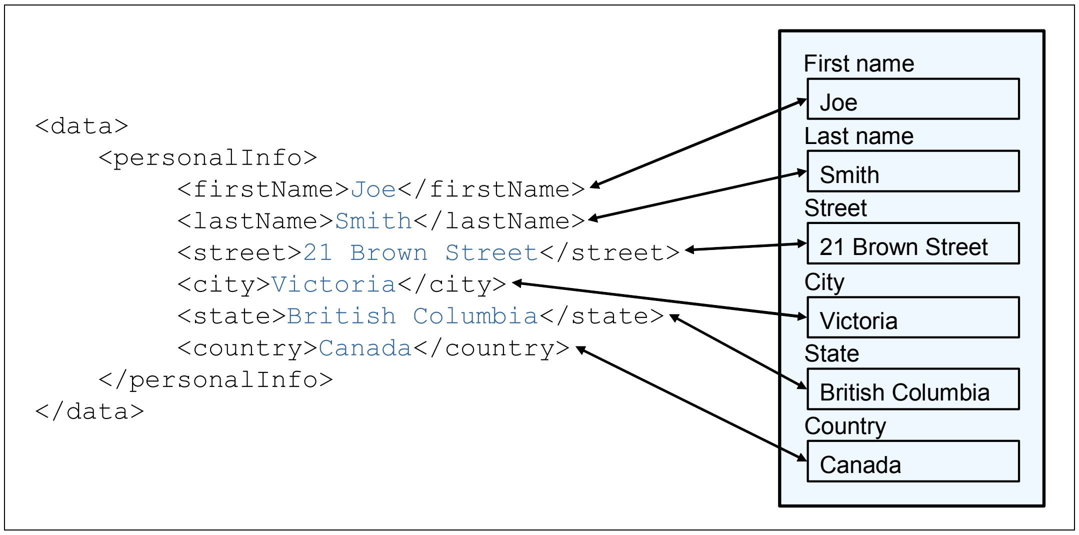
This determines the maximum value from a set of nodes. The string value of each node is converted to a number, then the minimum value is determined.

3.6.4 XForms device independence

In this section we discuss XForms device independence.

Host languages provide presentation layers for XForms views

The purpose of the XForms controls is to provide data access views of the model to containing applications. The most obvious view, of course, is a presentation layer for rendering the form to an end user, and the XForms controls can indeed be used directly by a minimalist rendering engine. However, the intent of the XForms design is to allow sufficient abstraction so that XForms forms can be hosted by XML-aware container applications that consume model views and augment them according to application-specific requirements. See Figure 3-5.



```
<data>
    <personalInfo>
         <firstName>Joe</firstName>
         <lastName>Smith</lastName>
         <street>21 Brown Street</street>
         <city>Victoria</city>
         <state>British Columbia</state>
         <country>Canada</country>
    </personalInfo>
</data>
```

First name: Joe
Last name: Smith
Street: 21 Brown Street
City: Victoria
State: British Columbia
Country: Canada

Figure 3-5 XForms links data to presentation layer

At the horizon of the abstraction, model views could be created and used to drive back-end processing of data, for example, workflows or data shredding for databases or content repository metadata. Generally, though, the short-term goal of the XForms view abstraction is to allow it to be skinned by (incorporated into) other host languages in order to meet the many diverse requirements that arise on the World Wide Web. One obvious host language is XHTML, but VoiceXML can be used to satisfy advanced accessibility needs, and WML (or minimalist rendition) can be used on small devices. See Figure 3-6.

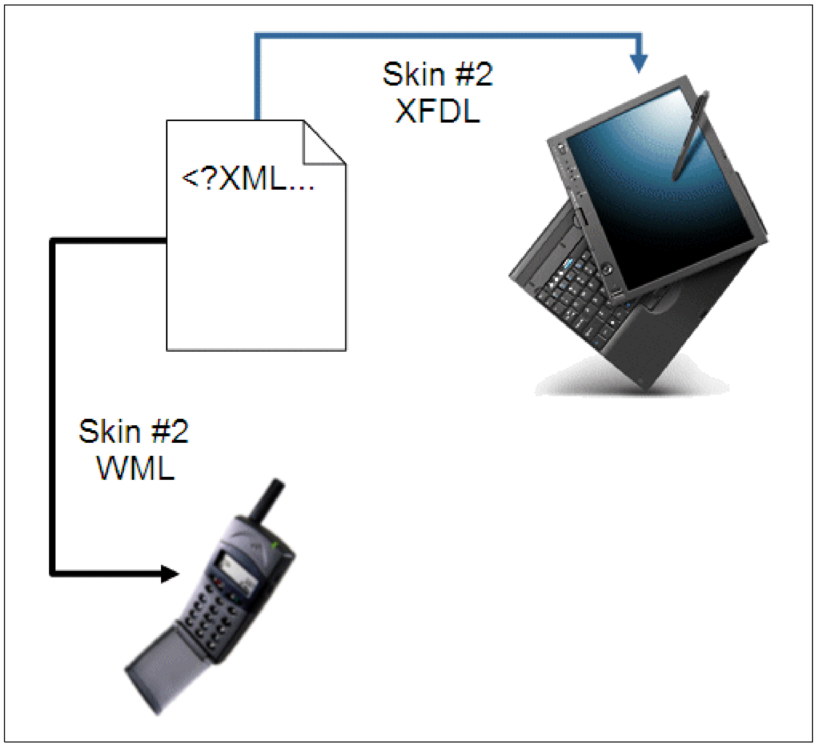


Figure 3-6 Re-skin one model with one or more presentation layers

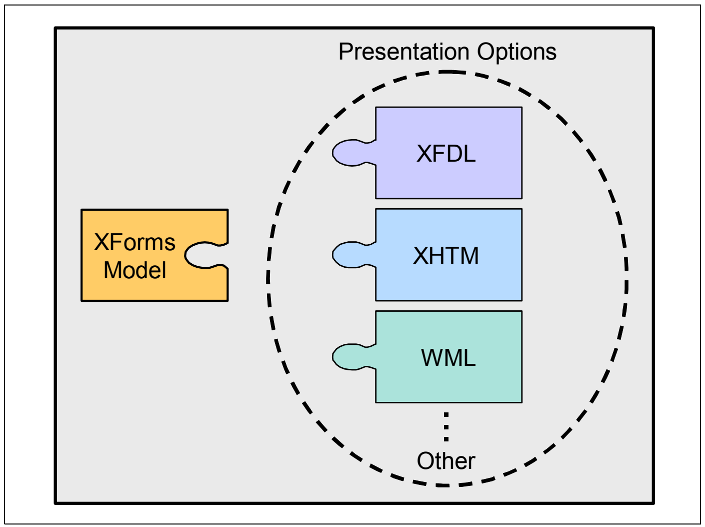


Figure 3-7 A single XForms Model can be linked to several presentation layers

XForms controls are intended to abstract data access sufficiently to allow *skinning* of views with a variety of host languages. For example, while we might use XFDL on our laptop, WML may prove to be more suitable for a PDA or a mobile phone. The host-language provides information about pagination, precision layout, and enhanced features such as attachment handling, digital signatures, and wizard front-ends.

3.7 Workplace Forms: XForms and XFDL

XForms defines the core business processing of forms data, not the presentation layer of the form itself, and therefore is designed to be used in conjunction with a variety of other languages that excel at presentation design that can be used depending on need such as XHTML, WML, and XFDL.

XForms provides increased interoperability. This allows for standardized forms interoperability with business partners, customers, and suppliers and enables process/value chain integration. ISV application processing interoperability between vendors provides customers with flexibility and choice supporting heterogeneous environments.

This interoperability provides faster time-to-market and reduced development costs. XForms embeds forms data processing rules using an open standard. Therefore, standard XForm processors can be used instead of creating custom code for each form.

Challenge example: Every bank processing a mortgage form must create custom code to ensure that the hundreds of application rules are processed correctly, such as spousal information.

Solution: An XForms mortgage application would embed the rules that describe when spousal information is relevant for applications such as joint mortgage applications only.

This standardization facilitates the creation of reusable form components leveraged by industry. Forms Standards enables libraries of reusable standard forms and form components. Financial and insurance industries have found this standardization to be invaluable.

There is an inherent value in XForms in providing multi-platform support as well. UI standardization provides a model to support multi-platform, accessibility, localization, and roles within forms. Forms and their data represent the currency of today's on demand transactions, which require an interoperable, non-proprietary standard for forms and the industry transactions these forms represent.

3.7.1 XForms versus XML Data Model

In this section we discuss XForms versus XML Data Model.

Benefits of Data Model

Whether you are using the XML Data Model or the XForms Model, the benefit of using a data model is the same. It allows the data to be abstracted from the form's presentation layer as arbitrary XML data structures.

These data structures are known as XML data instances. This allows for the data captured in the form to be easily extracted upon submission or replaced for pre-population purposes when the form is served to the user.

The XML Data Model

In this section we discuss the XML Data Model.

Grouping data for interoperability

Although XFDL is an XML syntax, it has not provided the ability to easily group data into blocks that would support interoperability. The XML Data Model addresses this problem by allowing form developers to create separate data sets within an XFDL form and to share data between those data sets and regular form elements.

Essentially, the XML Data Model is a block of XML that is placed at the beginning of a form, within the global page's global item, as shown in Example 3-1.

Example 3-1 XML Data Model

```
<globalpage sid="global">
   <global sid="global">
         <xmlmodel> ... XML Data Model ... </xmlmodel>
   </global>
</globalpage>
```

This block of XML allows for arbitrary data, meaning that it can contain any data and can be formatted in any manner. Furthermore, individual elements in the data model can be bound to one or more elements in the form description. This binding causes the elements to share data. If one element is changed, the other elements are updated to mirror that change.

This allows you to create a separate block of data within the form, format it any way you like, and bind it to form elements so that data entered by the user is automatically copied to the data model. For example, you could include the block of data that is required by an application (such as a PO system), format the data so that it complies with a specific schema, and then bind that data model to the form description. The result is a block of XML data that can be structured to meet any needs, extracted easily by other applications, and transmitted without the rest of the form.

Since the XML Data Model was the predecessor to XForms, there is substantial similarity between the way the XML Data Model and the XForms Data Model are handled.

Using Data Model in XML applications

The XML Data Model is most useful when integrating eForms with applications that already use XML, especially if those applications already offer XML interfaces. In these cases, you can design forms that submit the XML data directly to the application, and you do not need to program a custom module that extracts the data from the form. Furthermore, you can format the data to match any schema, and validate the data against the schema before submission.

Using XML Data Model over XForms

The most significant reason to select the XML Data Model over the XForms Model is that currently the development process is easier for the XML Model solution. However, the long term value of using the XForms Data Model, in most cases, will outweigh this added complexity.

Using XForms over the XML Data Model

XForms may be a better solution than the XML Data Model in the following situations:

- If the form is mostly tables.
- If the customer has heavily invested in XML standards and expects to leverage XForms as a standard in the future.
- If the customer already knows XPath or XForms from work with other products.
- If the form is to be built from scratch (rather than converted from a previous XFDL version form).
- If the client has or is prepared to develop a comprehensive XML schema for the form first.
- If the forms project needs some of the objects provided only when using XForms.

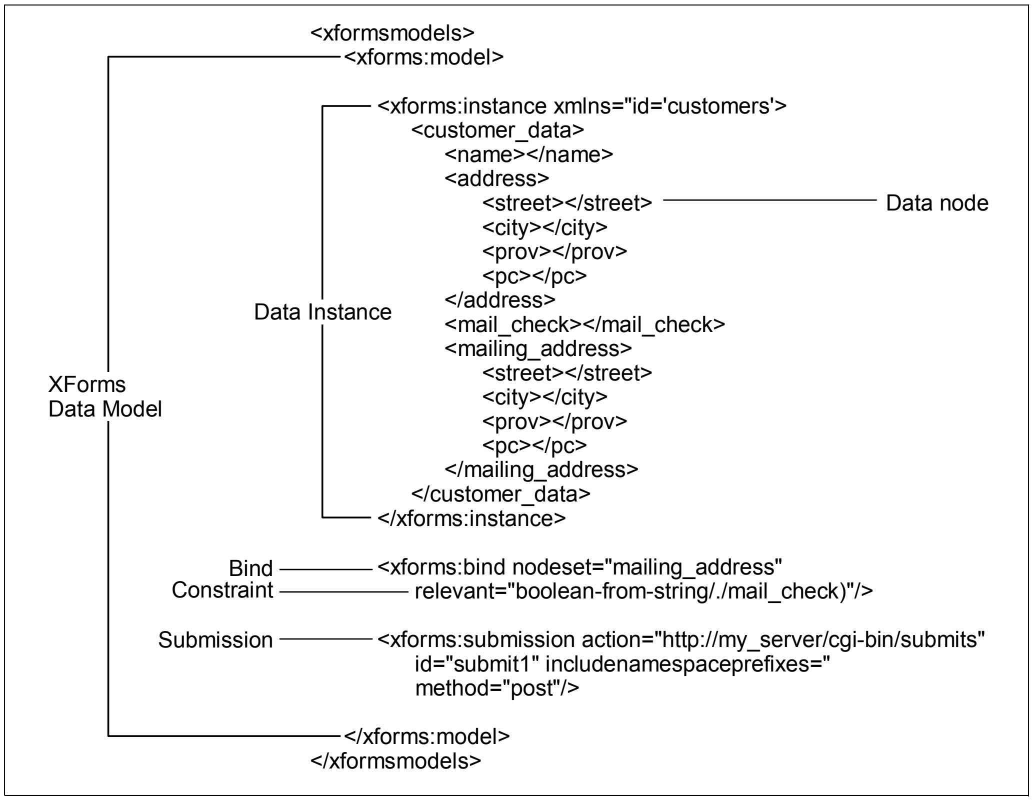
- XForms submit allows you to more effectively provide an SOA solution. A live form can submit data to and receive data from any service that speaks XML. This allows for a wide variety of mid-population and lookup scenarios.

3.8 The XForms Model

The XForms Model resides at the beginning of a form, inside the form global. It defines the data structure of the form, including:

- XML data instances
- XML schemas
- Business logic (binds, actions/events)
- Dynamic constraints
- Submissions rules

Each XForms Model contains the following (see Figure 3-8).



```
<xformsmodels>
 <xforms:model>

  <xforms:instance xmlns="id='customers'>
   <customer_data>
    <name></name>
    <address>
     <street></street>
     <city></city>
     <prov></prov>
     <pc></pc>
    </address>
    <mail_check></mail_check>
    <mailing_address>
     <street></street>
     <city></city>
     <prov></prov>
     <pc></pc>
    </mailing_address>
   </customer_data>
  </xforms:instance>

  <xforms:bind nodeset="mailing_address"
   relevant="boolean-from-string/./mail_check)"/>

  <xforms:submission action="http://my_server/cgi-bin/submits"
   id="submit1" includenamespaceprefixes="
   method="post"/>

 </xforms:model>
</xformsmodels>
```

Figure 3-8 Sample XForms Data Model

The XForms Model contains three core parts that work together to create a complete model.

Data instances

Data instances are arbitrary blocks of XML. A data model may contain any number of data instances, and each instance is normally created to serve a particular purpose.

Binds

Binds are used to affect data instances in a variety of ways, rather like setting properties for the data elements.

Submission rules

Each data instance may have an associated set of submission rules. These rules control how a data instance is transmitted when it is submitted for processing. This is an optional feature, and is only necessary when you want to submit the data instance by itself, without the rest of the form. There are many cases where you may want to submit the entire form, and then retrieve the data instance from the form during processing. This is particularly true when you are using signatures on your forms.

The XForms submit is key to enabling the form to effectively participate in the SOA world. This provides the solution to exchange data with disparate services across the enterprise.

Adding schemas

When adding schemas to your form, you can choose to either embed one or more schema files in the form itself, or refer to external schema files that are saved on the user's computer. Unlike the XML Data Model, XForms automatically performs schema validation. Therefore, you do not need to use XFDL functions to manually validate the schema.

3.8.1 XPath - what it is

XForms uses XPath to address data nodes in binds, express constraints, and specify calculations. Simple XPath expressions resemble file system and directory paths in appearance. Instead of moving through files and folders, XPath expressions move through data nodes. For example, consider the data instance shown in Example 3-2.

Example 3-2 Data instance

```
<purchaseOrder>
    <products>
        <gadget></gadget>
        ...other nodes...
    </products>
</purchaseOrder>
```

If you want to refer to the <gadget> node, you would also need to reference its parent nodes. For example:

`purchaseOrder/products/gadget`

When you create your data model, its nodes represent all of the elements, attributes, data, and processing instructions that you want to have in the form. Like a file system, these nodes can be represented by a tree. The root element of an instance is the one immediately inside the <xforms:instance> tag. The other elements and attributes form the branches of the tree, while attributes and text values form the leaves.

XPath referencing allows you to associate these nodes or nodesets with items displayed in the form, or with binds and properties that calculate values or place limitations on the nodes.

Each node has the following properties:

- Name — the name of the node. For example:

  `<gadget>`

- Value — the data contained in the node. For example:

  `<gadget>7</gadget>`

Note that the value may also be empty.

- Parent — Every node except the root node has a parent. In the following example, <products> is the parent of <gadget>:

```
<products>
   <gadget></gadget>
</products>
```

- Children — nodes contained within another node. In the following example, <gadget> is the child of <products>:

```
<products>
   <gadget></gadget>
</products>
```

- Position — the location of the node relative to all the other nodes. For example:

```
purchaseOrder/products/gadget
```

Additionally, some nodes have the following properties:

- Attributes — additional parameters added to the node that extend its functionality. For example:

```
<price currency="USD"></price>
```

- Namespaces — Namespace parameters identify a node as being part of a particular namespace. For example, to indicate that the <approvalNumber> node is in the xmlns:finance="http://example.org/finance" namespace, you would write:

```
<Finance:approvalNumber>
```

3.9 Processing e-forms with XForms objects

XForms is designed to submit only the data in the model. XFDL extends this to support document-centric submission (via HTTP Post). In order to perform this submit, the submission rules must be set:

- Where the data goes when submitted
- How the data is sent (get, put, post)
- The MIME type for the data
- What to do with the response
- Whether the XForms Model can update itself
- Whether the data in the XForms Model can be replaced with response data

XForms is designed to submit data from the XForms data model and to ignore the rest of the form, including bindings, presentation, and so on. The result is that data and only data is submitted.

Using an XForms submission, you can submit a complete data instance, or a portion of a data instance. You define the root node of the submission (choosing any element in your data instances), and that node and all of its children are submitted, as shown in Figure 3-9.

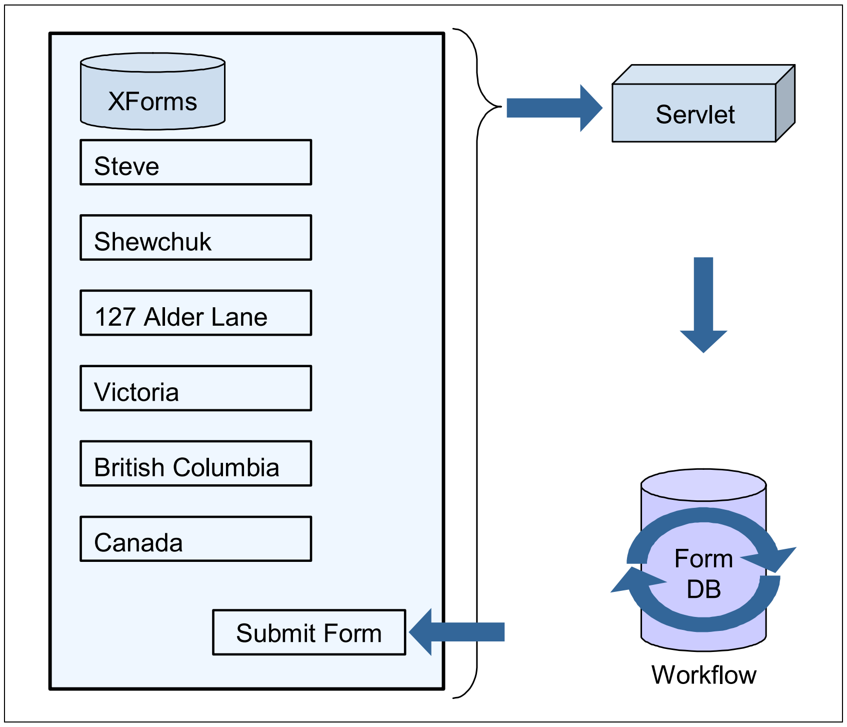


Figure 3-9 Submit form and then process data using XForms

You can also set the model to update itself with the response data. This will completely replace a single data instance in your form with the response data. This requires you to model your data so that this sort of replacement makes sense, as shown in Figure 3-10.

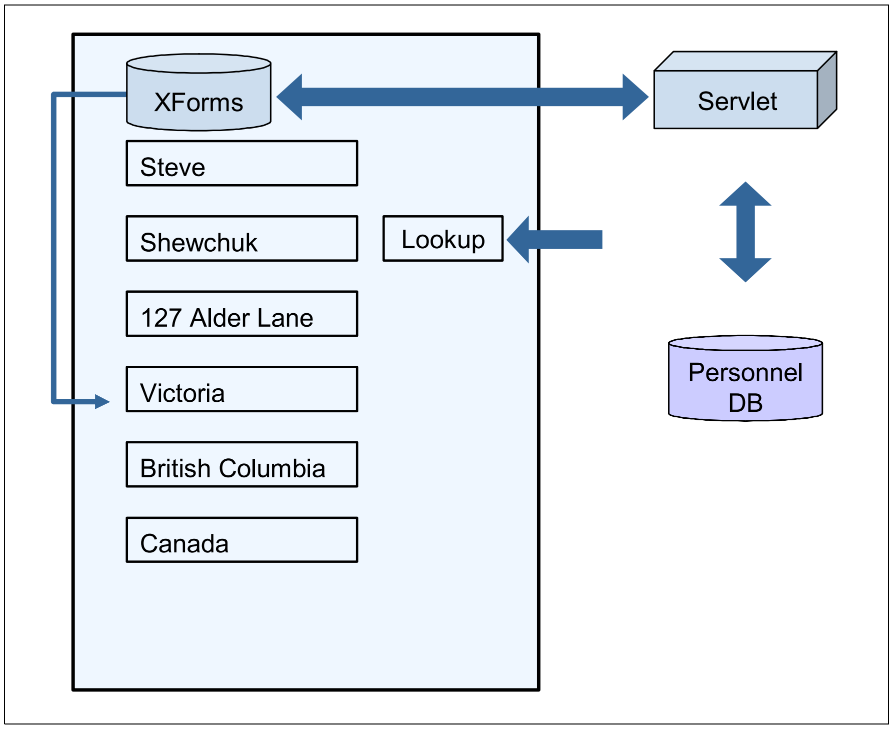


Figure 3-10 Return results based on submitted criteria

When the form is presented to the user, the XForms Data Model can be pre-populated with data based on a criteria like:

- Customer number
- User ID
- User role

With this XForms implementation, your forms application is now able to submit XML data to any server in the enterprise. The form is enabled to receive an XML response and automatically populate the form with that response. This is truly a SOA solution.

4

Approaches to integrating Workplace Forms

This chapter describes a range of approaches for integrating Workplace Forms into one's environment. We begin by defining the context of integrations, then describe in greater detail the different levels possible for integration.

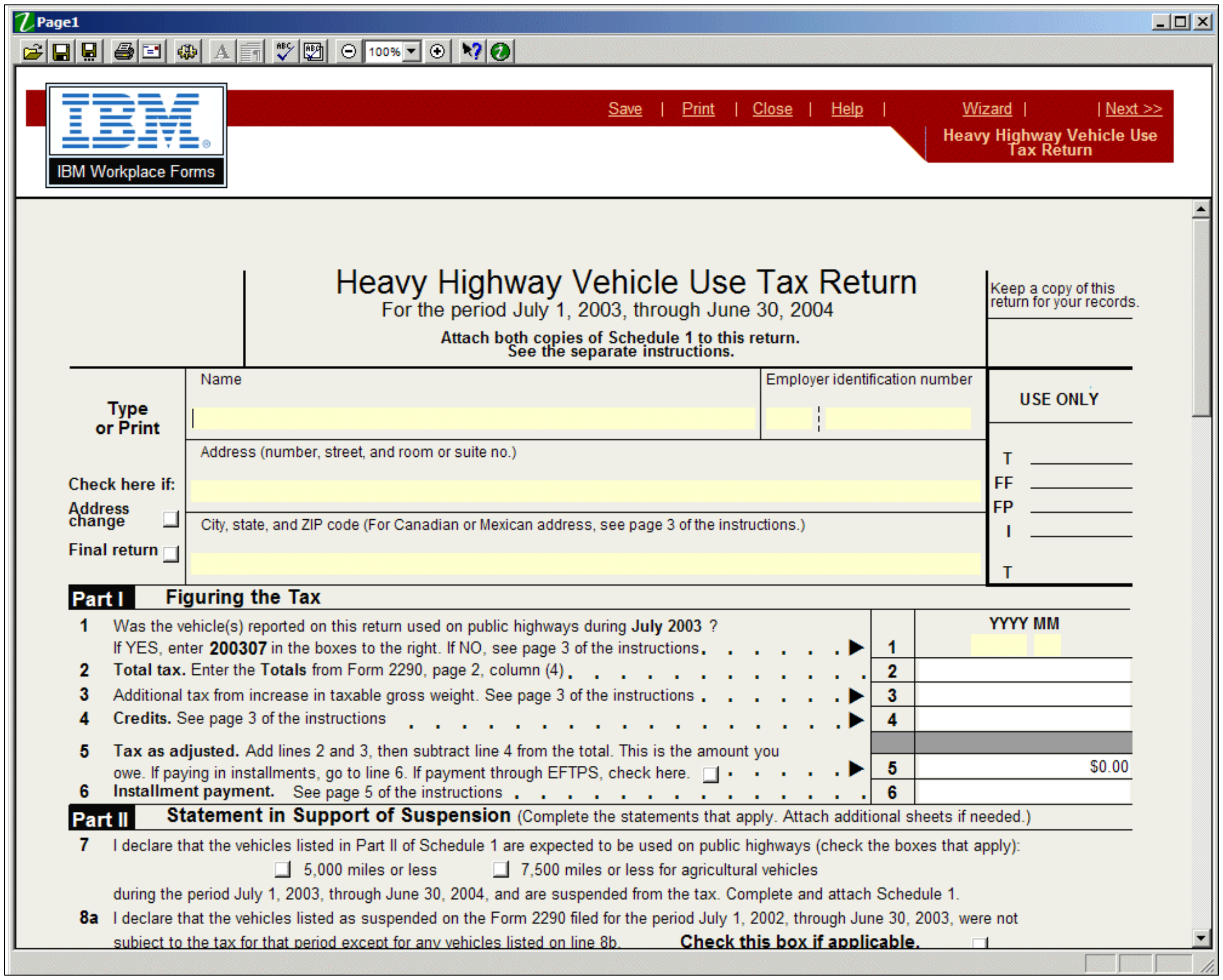
We consider these topics:

- Integration: what this means in the context of Workplace Forms
- Workplace Forms document model and straight-through integration
- Aspects of integrating Workplace Forms
- Integration points summary
- Partitioning of features and functionality

4.1 Integration: what this means within the context of Workplace Forms

Workplace Forms provides a component technology that is based on open standards. The discussion of integration typically depends on the context of the customer scenario, infrastructure, and solution scope.

As a level set, the simplest use of Workplace Forms is standalone. You can launch the Workplace Forms Viewer by double-clicking a form on your desktop. This causes the Workplace Forms Viewer to launch as a standalone application and present the form for data entry or viewing (Figure 4-1).


Page1
100%
IBM Workplace Forms
Save | Print | Close | Help | Wizard | | Next >>
Heavy Highway Vehicle Use Tax Return

Heavy Highway Vehicle Use Tax Return
For the period July 1, 2003, through June 30, 2004
Attach both copies of Schedule 1 to this return.
See the separate instructions.

Keep a copy of this return for your records.

Type or Print

Name

Employer identification number

USE ONLY

Address (number, street, and room or suite no.)

T
FF
FP
I
T

Check here if:
Address change
Final return

City, state, and ZIP code (For Canadian or Mexican address, see page 3 of the instructions.)

Part I Figuring the Tax

1 Was the vehicle(s) reported on this return used on public highways during **July 2003** ? If YES, enter **200307** in the boxes to the right. If NO, see page 3 of the instructions . . . . ▶ 1 YYYY MM
2 **Total tax.** Enter the **Totals** from Form 2290, page 2, column (4) 2
3 Additional tax from increase in taxable gross weight. See page 3 of the instructions . . . . ▶ 3
4 **Credits.** See page 3 of the instructions . . . . ▶ 4
5 **Tax as adjusted.** Add lines 2 and 3, then subtract line 4 from the total. This is the amount you owe. If paying in installments, go to line 6. If payment through EFTPS, check here. ☐ . . . . . . ▶ 5 $0.00
6 **Installment payment.** See page 5 of the instructions 6

Part II Statement in Support of Suspension (Complete the statements that apply. Attach additional sheets if needed.)

7 I declare that the vehicles listed in Part II of Schedule 1 are expected to be used on public highways (check the boxes that apply):
☐ 5,000 miles or less ☐ 7,500 miles or less for agricultural vehicles
during the period July 1, 2003, through June 30, 2004, and are suspended from the tax. Complete and attach Schedule 1.
8a I declare that the vehicles listed as suspended on the Form 2290 filed for the period July 1, 2002, through June 30, 2003, were not subject to the tax for that period except for any vehicles listed on line 8b. **Check this box if applicable.** ☐

Figure 4-1 Baseline example: the Workplace Forms Viewer running standalone as a desktop application

The Workplace Forms Viewer installation package provides us with the Workplace Viewer both as a standalone application and as a browser plug-in.

Now let us consider the standard means of integrating Workplace Forms. At a high level, there are a number of types of integrations:

- User interface (UI) integration
- Data integration
- Process integration
- Security context integration
- Client-side device/hardware integration

4.2 Workplace Forms document model and straight-through integration

Insight into the Workplace Forms document model helps us to understand what happens within the form when we prepopulate a form template, enter data, validate signatures, extract data, or interact with a process.

4.2.1 The Workplace Forms document model

First, let us examine the high-level components that make up a Workplace Forms document.

Workplace Forms are structured XML files that contain a separate data model and user-interface (Figure 4-2).

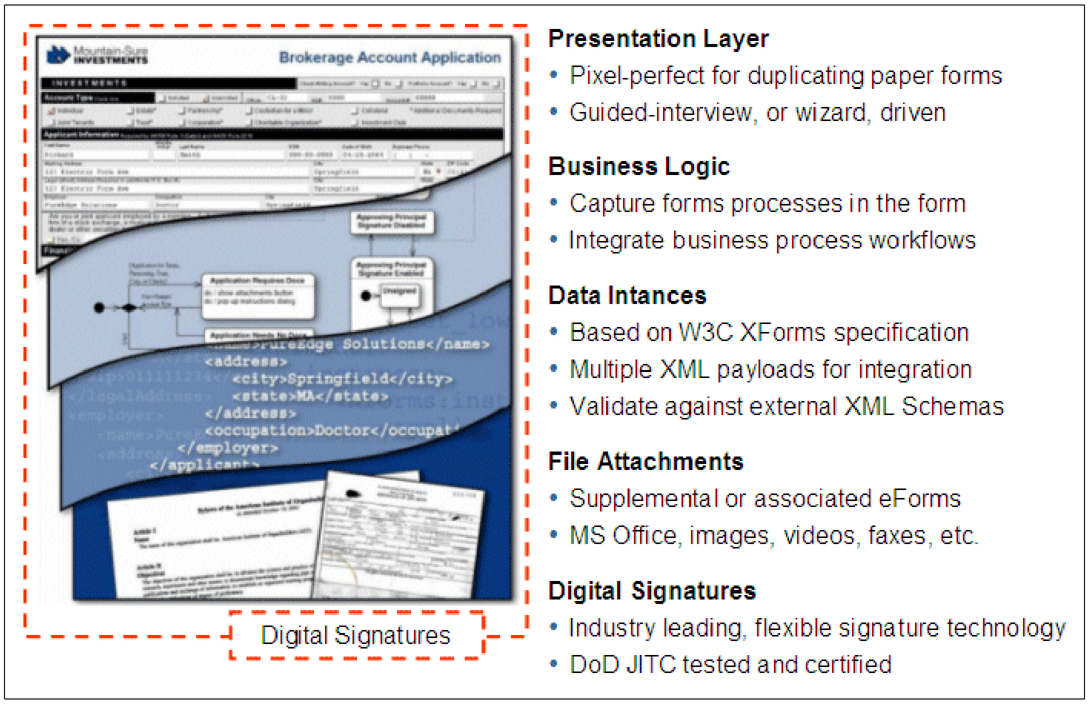

Brokerage Account Application
Digital Signatures
Presentation Layer
• Pixel-perfect for duplicating paper forms
• Guided-interview, or wizard, driven
Business Logic
• Capture forms processes in the form
• Integrate business process workflows
Data Intances
• Based on W3C XForms specification
• Multiple XML payloads for integration
• Validate against external XML Schemas
File Attachments
• Supplemental or associated eForms
• MS Office, images, videos, faxes, etc.
Digital Signatures
• Industry leading, flexible signature technology
• DoD JITC tested and certified

Figure 4-2 Workplace Forms: structured XML files with separate data model and user interface

Figure 4-3 shows a conceptual view of a Workplace Form document model.

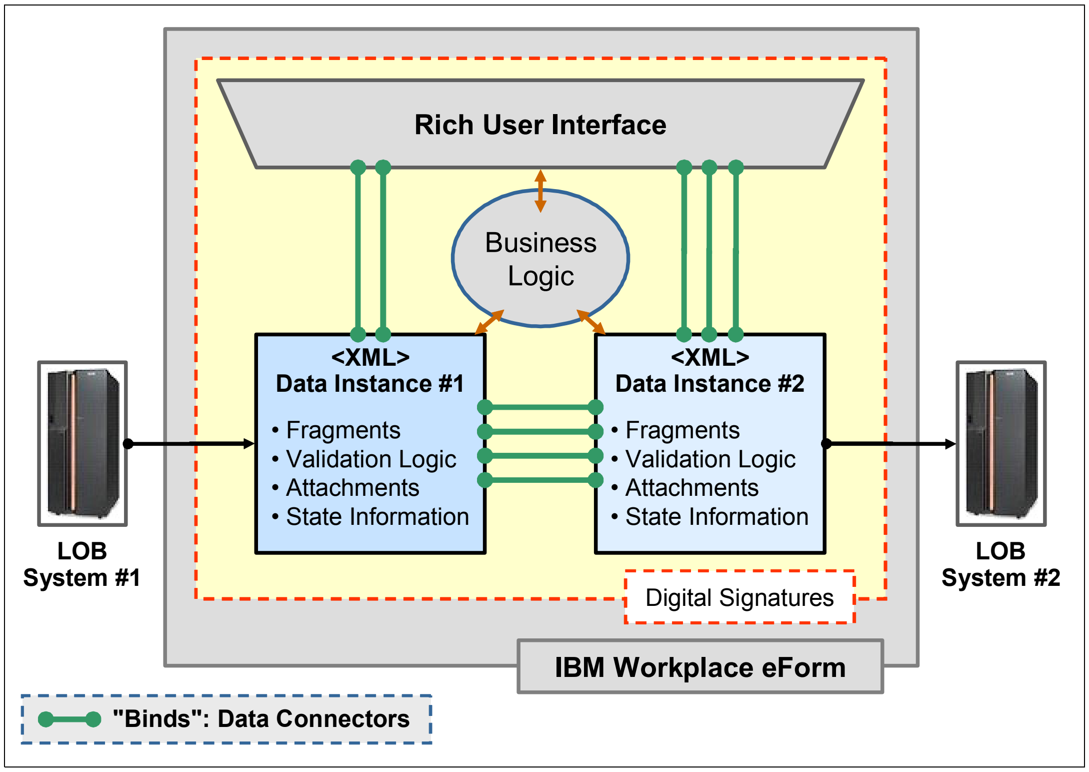


Figure 4-3 Conceptual view of a Workplace Form document model

Figure 4-3 is a conceptual representation of an IBM Workplace Form. The form provides separation of user interface (also referred to as presentation layer) and data model (from 0 → N discrete data instances).

In the above example, the form data model consists of two data instances. In practice, the form could contain no data instance at all, or many different data instances. Data instance #1 is used for form prepopulation, while data instance #2 is used for data integration to a line-of-business system.

4.2.2 Support for arbitrary XML instances

Support for arbitrary XML instances refers to the fact that you can take an XML schema from any external system (or alternately create your own), generate a compliant XML data instance, then embed that instance into the form. The elements of this instance are related to other aspects of the form by *binds*, shown in green in Figure 4-3. The form can contain 0 → n instances.

4.2.3 Straight-through integration

Straight-through integration refers of the ability of Workplace Forms to produce XML schema compliant data instances without the need for translation. The compliant data instance, or instances, reside within the form.

The usefulness of Workplace Forms straight-through integration functionality is enhanced by the ability to integrate data to multiple, disparate systems without requiring any translation. Furthermore, data can be presented in different ways to each system. For example, if an employee number must be eight digits for a green-screen legacy system, and is expected to be 16 digits for a complementary, modern HR system, a single form can contain two different data instances, and populate the data elements within it in different ways, as needed by each system. Once again, no translation external to the form is required. However, the form does have to do some translation within itself.

Lastly, notice that in both of the previous two figures, a digital signature is applied to the form as a whole, ensuring that the forms are *tamper-evident*. A single digital signature applies to all levels according to a set of filters.

4.3 Aspects of integrating Workplace Forms

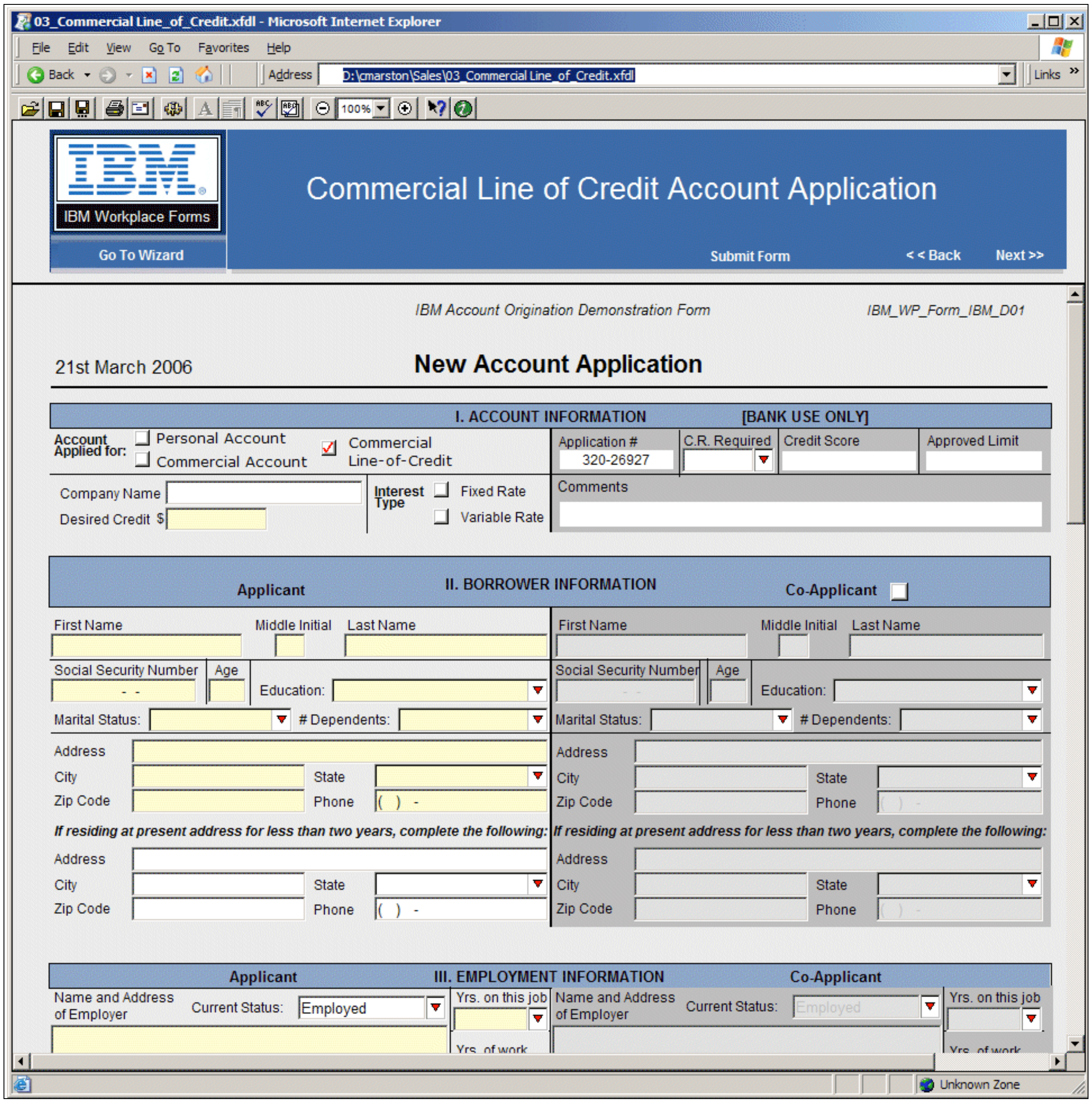
Now that we have covered the basic structure of Workplace Forms, let us drill-down and examine each of the different types of integration in more depth.

4.3.1 User interface (UI) integration

In this section we begin our discussion of integration.

Display of Workplace Forms within a Web page

We start by illustrating the most straightforward type of integration, namely, a form rendered within the context of a Web page. Figure 4-4 is an example of a pixel-precise traditional form page, suitable for printing.


03_Commercial Line_of_Credit.xfdl - Microsoft Internet Explorer

File Edit View Go To Favorites Help

Back · Address D:\cmarston\Sales\03_Commercial Line_of_Credit.xfdl · Links

100%

IBM Workplace Forms

Commercial Line of Credit Account Application

Go To Wizard · Submit Form · << Back · Next >>

IBM Account Origination Demonstration Form · IBM_WP_Form_IBM_D01

21st March 2006

New Account Application

I. ACCOUNT INFORMATION · [BANK USE ONLY]

Account Applied for:	☐ Personal Account	✓ Commercial Line-of-Credit	
	☐ Commercial Account		
Application #	C.R. Required	Credit Score	Approved Limit
320-26927			

Company Name

Desired Credit $

Interest Type: ☐ Fixed Rate ☐ Variable Rate

Comments

II. BORROWER INFORMATION

Applicant	Co-Applicant ☐
First Name · Middle Initial · Last Name	First Name · Middle Initial · Last Name
Social Security Number - - · Age · Education:	Social Security Number - - · Age · Education:
Marital Status: · # Dependents:	Marital Status: · # Dependents:
Address	Address
City · State	City · State
Zip Code · Phone ( ) -	Zip Code · Phone ( ) -
If residing at present address for less than two years, complete the following:	*If residing at present address for less than two years, complete the following:*
Address	Address
City · State	City · State
Zip Code · Phone ( ) -	Zip Code · Phone ( ) -

III. EMPLOYMENT INFORMATION

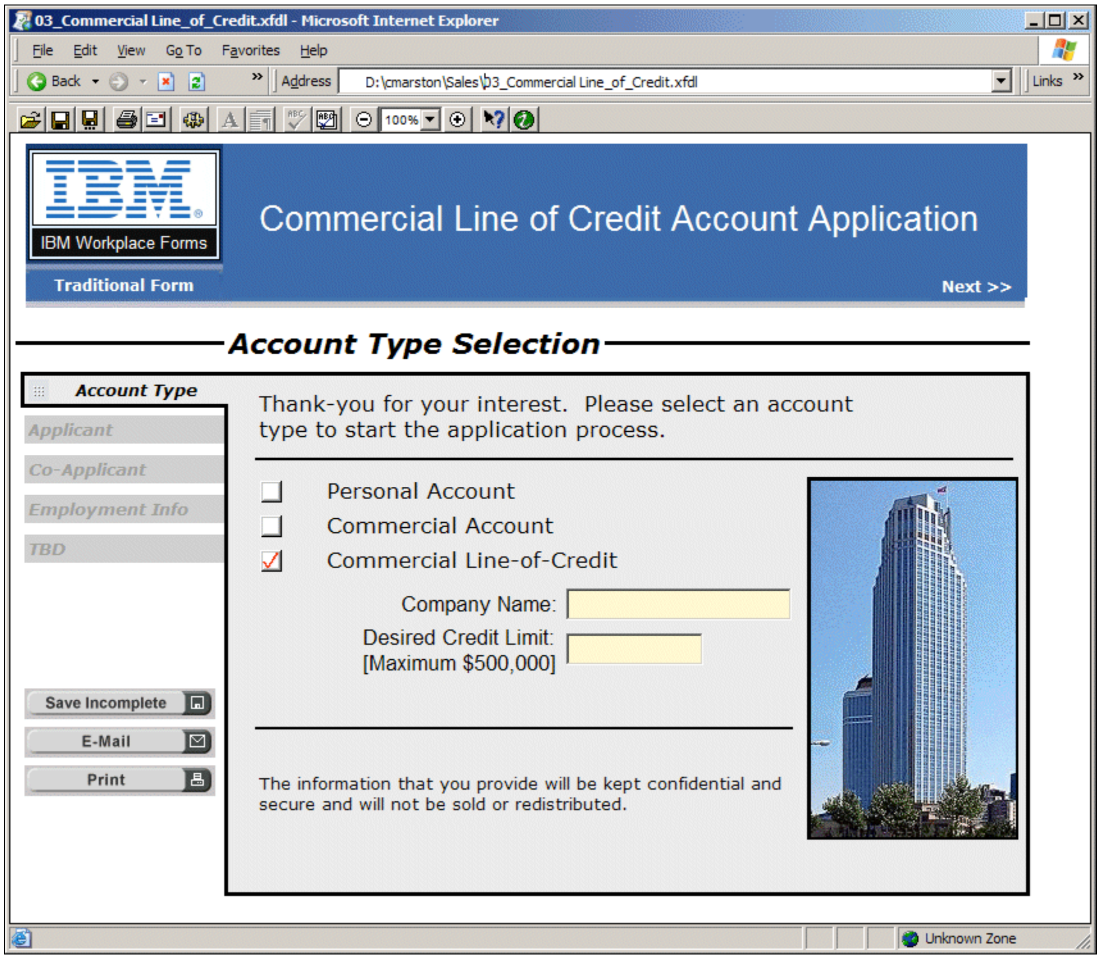
Applicant	Co-Applicant
Name and Address of Employer · Current Status: Employed · Yrs. on this job · Yrs. of work	Name and Address of Employer · Current Status: Employed · Yrs. on this job · Yrs. of work

Unknown Zone

Figure 4-4 Workplace Forms Viewer displaying a form within the Web browser

Display of forms to end users within a Web application context is perhaps the most common and basic form of user interface (UI) integration. In Figure 4-4, the Workplace Forms Viewer is running within the browser as a plug-in. Users typically navigate to forms by following links within a company Internet or intranet site. Alternately, HTTP links to Workplace Forms can be provided to users via e-mail, although this involves application-tier integration with an e-mail system or daemon.

Figure 4-5 illustrates an example of an interview-style wizard form page.


03_Commercial Line_of_Credit.xfdl - Microsoft Internet Explorer
File Edit View Go To Favorites Help
Back
Address D:\cmarston\Sales\03_Commercial Line_of_Credit.xfdl
Links
100%
IBM Workplace Forms
Traditional Form
Next >>
Account Type
Applicant
Co-Applicant
Employment Info
TBD
Save Incomplete
E-Mail
Print
Unknown Zone

Commercial Line of Credit Account Application

Account Type Selection

Thank-you for your interest. Please select an account type to start the application process.

☐ Personal Account
☐ Commercial Account
[✓ Commercial Line-of-Credit]

Company Name:

Desired Credit Limit: [Maximum $500,000]

The information that you provide will be kept confidential and secure and will not be sold or redistributed.

Figure 4-5 The Workplace Forms Viewer displaying another form page within a Web browser

Workplace Forms are 100% XML, and have a mime-type of:

```
application/vnd.xfdl
```

For file extensions:

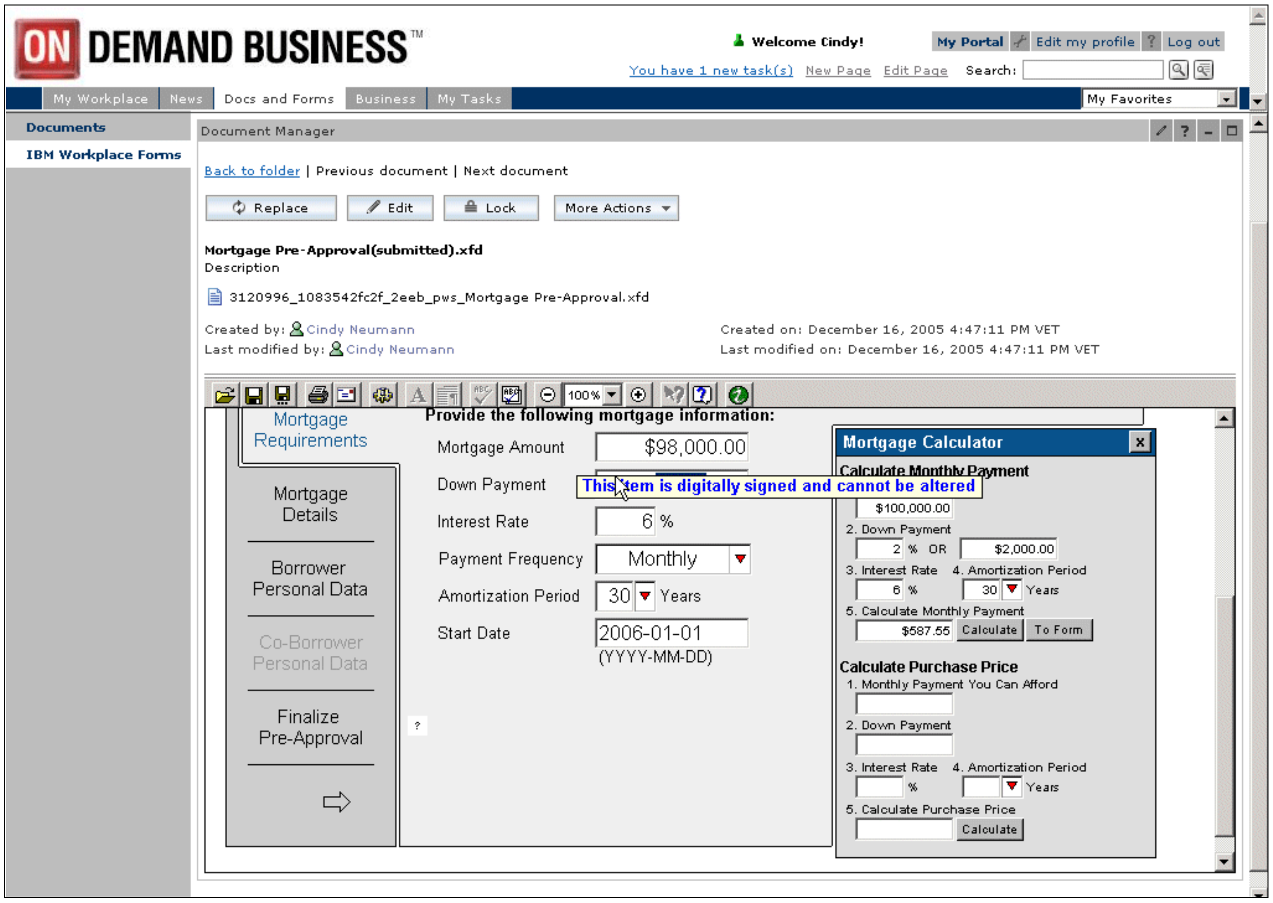
```
.xfd and .xfdl
```

Once you set the mime-type on the server, when you return a Workplace Form from the server, the browser recognizes and launches the Workplace Forms Viewer within the browser as a plug-in.

It is important to note that when creating forms applications, standard Web application design considerations apply.

Display of Workplace Forms within a portal page

Figure 4-6 shows a Workplace Forms Viewer displaying a mortgage pre-approval form within a portlet.



Mortgage Pre-Approval(submitted).xfd
Description
3120996_1083542fc2f_2eeb_pws_Mortgage Pre-Approval.xfd
Created by: Cindy Neumann
Last modified by: Cindy Neumann
Created on: December 16, 2005 4:47:11 PM VET
Last modified on: December 16, 2005 4:47:11 PM VET

Provide the following mortgage information:
Mortgage Amount $98,000.00
Down Payment
This item is digitally signed and cannot be altered
Interest Rate 6 %
Payment Frequency Monthly
Amortization Period 30 Years
Start Date 2006-01-01 (YYYY-MM-DD)

Mortgage Calculator
Calculate Monthly Payment
$100,000.00
2. Down Payment
2 % OR $2,000.00
3. Interest Rate 4. Amortization Period
6 % 30 Years
5. Calculate Monthly Payment
$587.55 Calculate To Form
Calculate Purchase Price
1. Monthly Payment You Can Afford
2. Down Payment
3. Interest Rate 4. Amortization Period
% Years
5. Calculate Purchase Price
Calculate

Figure 4-6 The Workplace Forms Viewer displaying a mortgage pre-approval form within a portlet

Figure 4-6 illustrates an example of how Workplace Forms can be displayed within a portal application. When delivered via portlets, Workplace Forms can be used as elements of composite portal applications. Inter-portlet communication provides us with a convenient avenue for data-integration, such as form template prepopulation. As an example, one might compose a UI with a client-list JSP™ on the left side of the UI, and an eForm portlet on the right. Selection of a client within the client-list JSP could be used to prepopulate a form template to the right.

Zero Footprint display of Workplace Forms

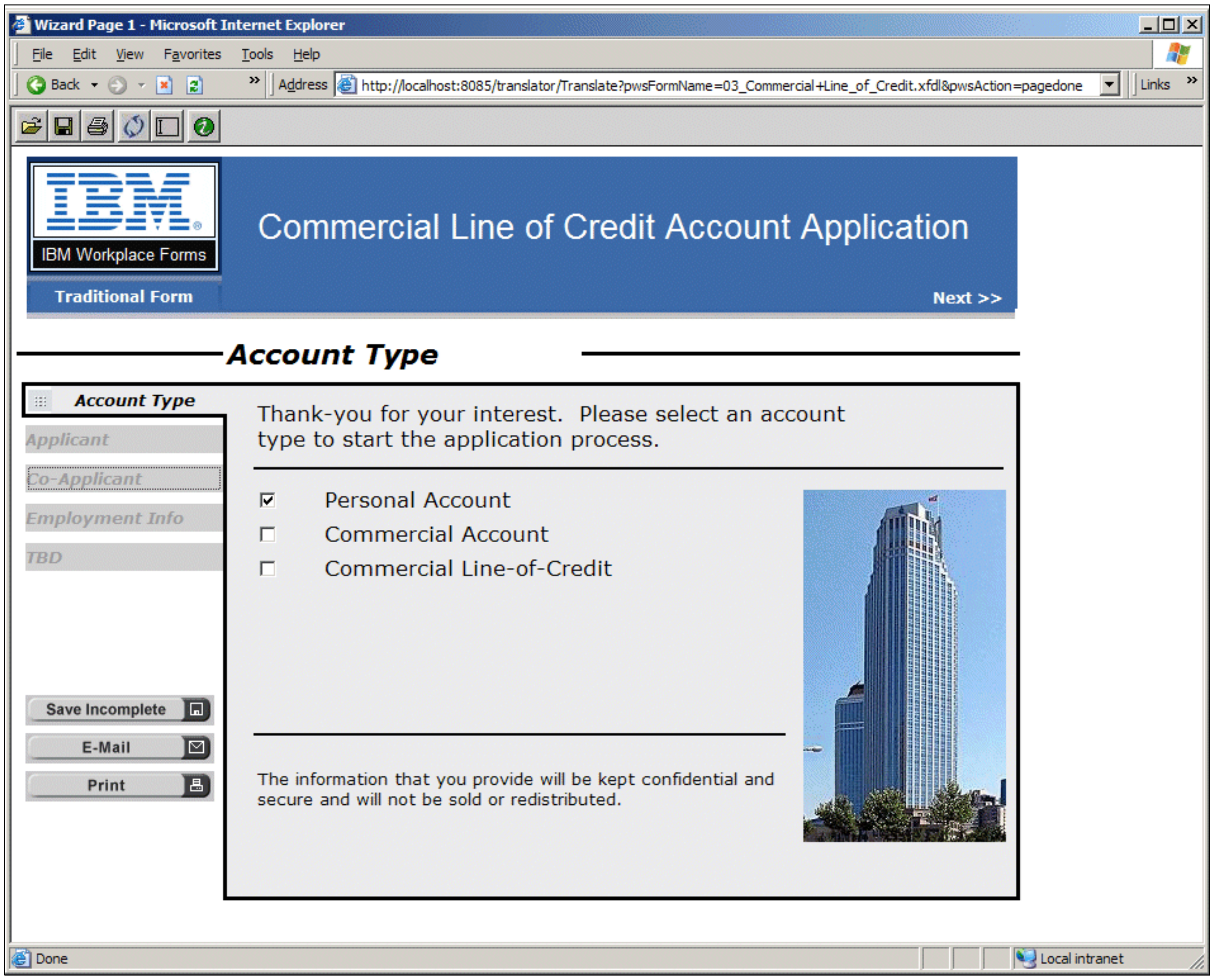
In certain situations, it may not be possible or desirable to install the Workplace Forms Viewer onto each user's computer. Typically, this situation results from:

- Desktop *lockdown* — users not having sufficient privileges to install the application
- Infrequent form users who do not wish to install another program
- Dial-up or low-bandwidth users who cannot download the Workplace Forms Viewer in a timely manner
- Version management/upgrade concerns
- Software licensing considerations

Whatever the reason, it may be desirable to provide access to forms without requiring the installation and management of the Workplace Forms Viewer. In this case, the Workplace Forms Webform Server provides us with the ability to translate server-side XFDL documents into HTML and JavaScript™, so that they can be displayed within standard browsers — with no Viewer required. This is called the Zero Footprint® display of Workplace Forms, as shown in Figure 4-7.

Attention: Also refer to Chapter 7, "Zero Footprint with Webform Server" on page 447, where we discuss in greater detail the considerations when implementing a Zero Footprint solution using the sample scenario application presented in the book.

It is worth noting that the Webform Server does not offer as much overall functionality as the Viewer, particularly in light of signature support. Therefore, the Viewer is still preferable in situations that have high security requirements concerning signatures and document authenticity.



http://localhost:8085/translator/Translate?pwsFormName=03_Commercial+Line_of_Credit.xfdl&pwsAction=pagedone

Commercial Line of Credit Account Application

Account Type

Thank-you for your interest. Please select an account type to start the application process.

☑ Personal Account
☐ Commercial Account
☐ Commercial Line-of-Credit

The information that you provide will be kept confidential and secure and will not be sold or redistributed.

Figure 4-7 Rendering of Workplace Form using Zero Footprint option

An important note is that on the server-side, Webform Server maintains the complete XFDL form, giving us the previously described benefits of the Workplace Forms for straight-through integration to one or more systems while also enabling end users without the Workplace Forms Viewer.

Display of Workplace Forms within Notes and Domino

Notes and Domino provide us with an excellent foundation onto which we can overlay Workplace Forms. Domino extends the Workplace Forms products with a number of benefits:

- Forms management:
  - Domino agent reads attached form and displays in Domino view
  - Domino Forms live (attachments)
- Document-based workflow: Place Workplace Forms into existing workflow.
- Use of Domino mail as a transport.
- Replication/server-side.
- Encryption.
- As a supporting technology: Support Workplace Forms with additional Domino content (FAQs, travel polices, and so on).

Looking at it from the opposite perspective, Workplace Forms extends the capabilities of Notes/Domino with:

- Pixel perfect form layout
- Guided, wizard page front-ends
- Overlapping digital signatures
- W3C XForms support
- Form Extension (FCI/IFX), such as:
  - Device integration (biometrics, signing tablets, and so on)
  - Third-party encryption

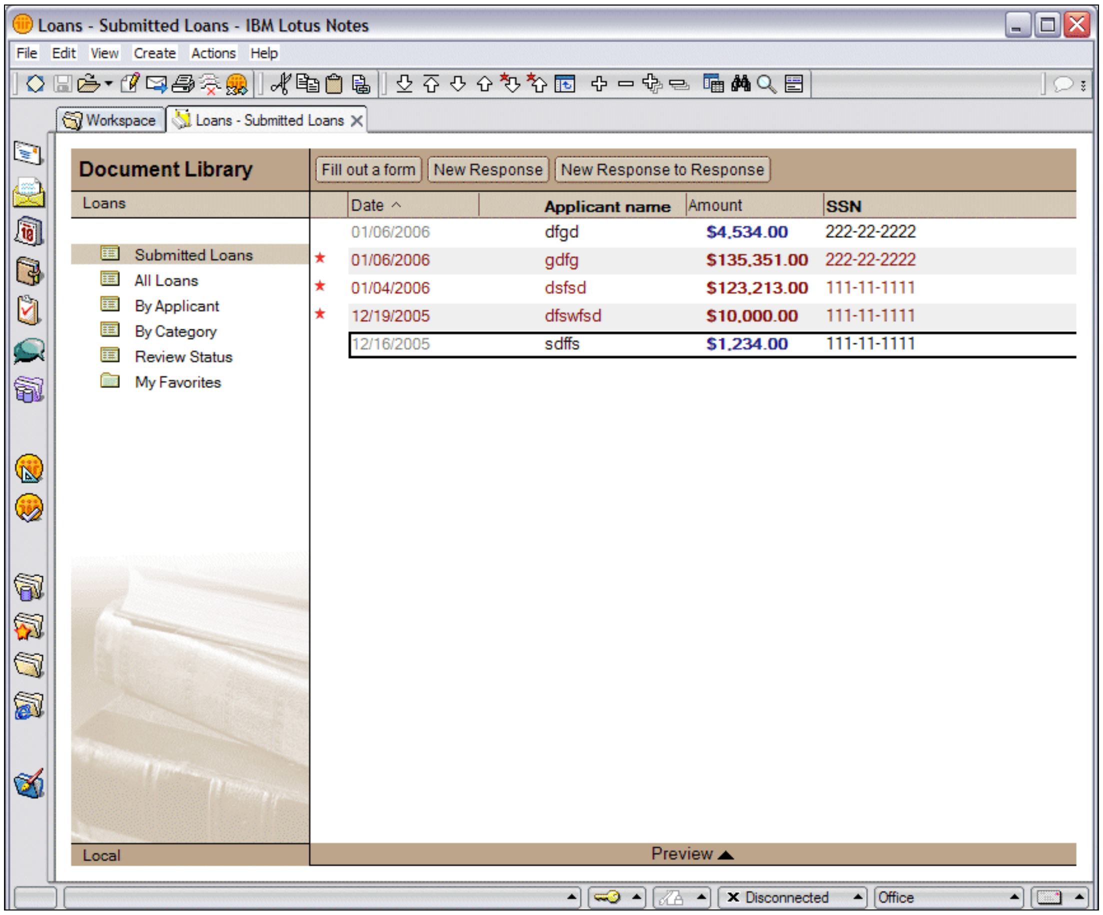
Note: There are several standard models for solutions involving integration of Workplace Forms and Domino. These include the use of Lotus Notes and Domino via:

- Web client (browser) access + Workplace Forms Viewer. We discuss this in 9.2, “Overview and objective of Domino integration” on page 495.
- Notes client access + Workplace Forms Viewer. We provide four different scenarios in 9.7, “Scenario 2 - integrating Forms Viewer with Notes Client - overview and objective” on page 573.
- Notes client access + Zero Footprint Forms (Webform Server). We give an overview of this solution in 9.11, “Scenario 3 - Domino integration using HTTP submissions for completed forms” on page 606.

For more detailed discussion and examples refer to Chapter 9, “Lotus Domino integration” on page 493.

Below are several example figures showing Workplace Forms being used with Lotus Notes and Domino.

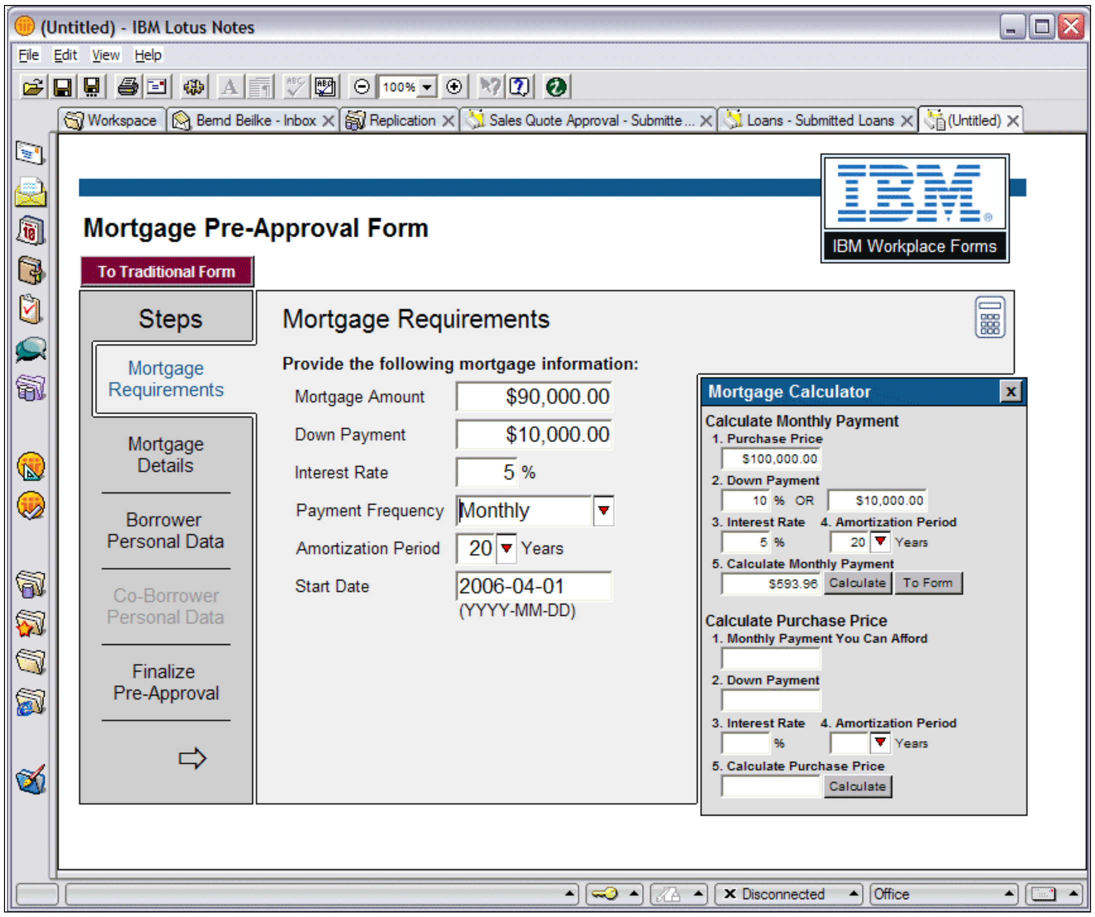
Figure 4-8 illustrates a database of Workplace Forms.



	Date	Applicant name	Amount	SSN
	01/06/2006	dfgd	$4,534.00	222-22-2222
★	01/06/2006	gdfg	$135,351.00	222-22-2222
★	01/04/2006	dsfsd	$123,213.00	111-11-1111
★	12/19/2005	dfswfsd	$10,000.00	111-11-1111
	12/16/2005	sdffs	$1,234.00	111-11-1111

Figure 4-8 Database containing Workplace Forms

Clicking **Fill out a form** opens a new form template, as shown in Figure 4-9.



Mortgage Pre-Approval Form

Mortgage Requirements

Provide the following mortgage information:

Mortgage Amount	$90,000.00
Down Payment	$10,000.00
Interest Rate	5 %
Payment Frequency	Monthly
Amortization Period	20 Years
Start Date	2006-04-01 (YYYY-MM-DD)

Mortgage Calculator

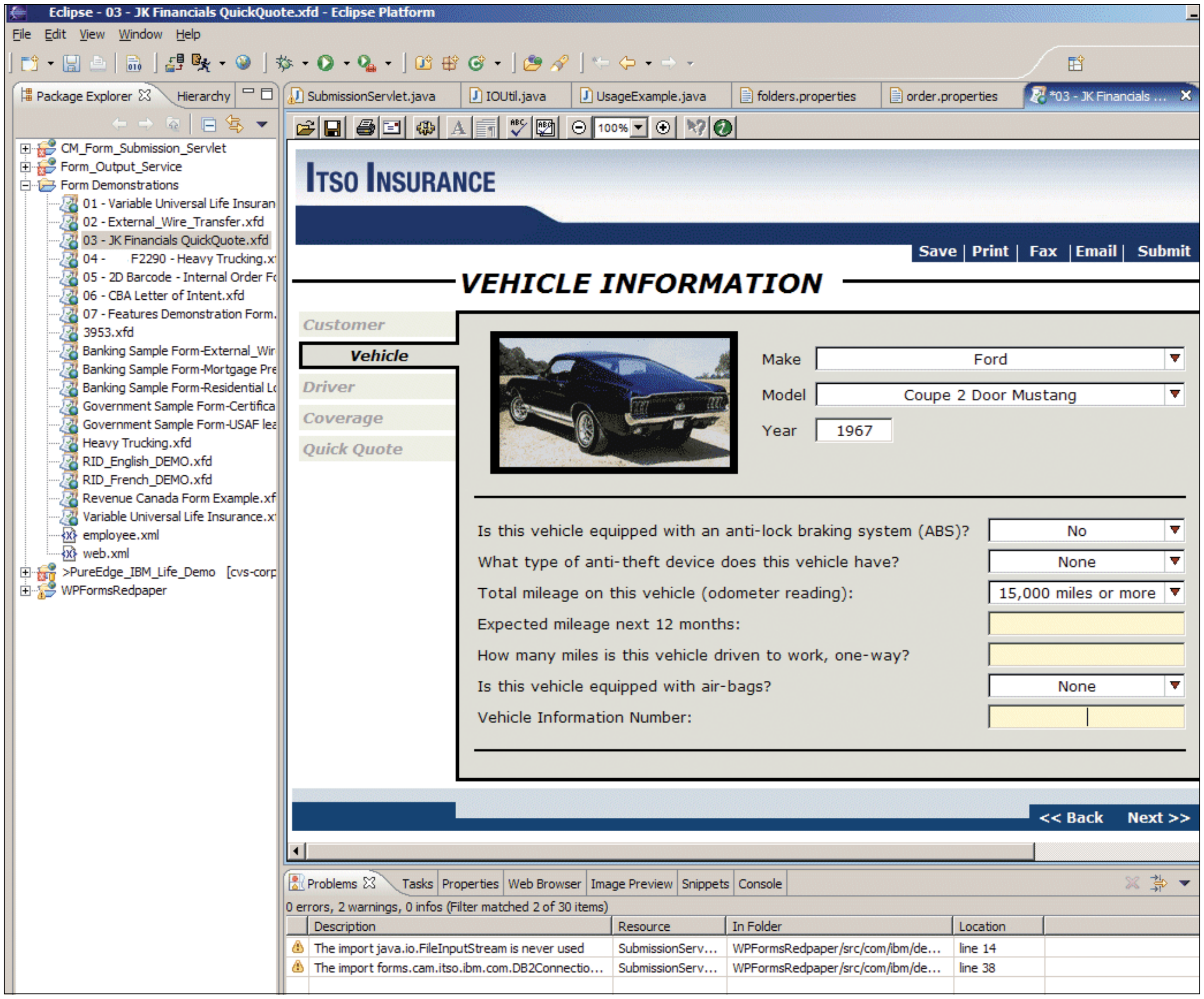
Calculate Monthly Payment
1. Purchase Price: $100,000.00
2. Down Payment: 10 % OR $10,000.00
3. Interest Rate: 5 % 4. Amortization Period: 20 Years
5. Calculate Monthly Payment: $593.96 Calculate To Form

Calculate Purchase Price
1. Monthly Payment You Can Afford
2. Down Payment
3. Interest Rate % 4. Amortization Period Years
5. Calculate Purchase Price Calculate

Figure 4-9 Workplace Form displayed within Notes/Domino

Display of Workplace Forms within Eclipse

Figure 4-10 shows an example of a Workplace Form displayed within the Eclipse Platform.


Eclipse - 03 - JK Financials QuickQuote.xfd - Eclipse Platform

File Edit View Window Help

Package Explorer | Hierarchy

- CM_Form_Submission_Servlet
- Form_Output_Service
- Form Demonstrations
  - 01 - Variable Universal Life Insuran
  - 02 - External_Wire_Transfer.xfd
  - 03 - JK Financials QuickQuote.xfd
  - 04 - F2290 - Heavy Trucking.x
  - 05 - 2D Barcode - Internal Order F
  - 06 - CBA Letter of Intent.xfd
  - 07 - Features Demonstration Form.
  - 3953.xfd
  - Banking Sample Form-External_Wir
  - Banking Sample Form-Mortgage Pre
  - Banking Sample Form-Residential L
  - Government Sample Form-Certifica
  - Government Sample Form-USAF lea
  - Heavy Trucking.xfd
  - RID_English_DEMO.xfd
  - RID_French_DEMO.xfd
  - Revenue Canada Form Example.xf
  - Variable Universal Life Insurance.x
  - employee.xml
  - web.xml
- >PureEdge_IBM_Life_Demo [cvs-corp
- WPFormsRedpaper

SubmissionServlet.java | IOUtil.java | UsageExample.java | folders.properties | order.properties | *03 - JK Financials ...

ITSO INSURANCE

Save | Print | Fax | Email | Submit

VEHICLE INFORMATION

Customer
Vehicle
Driver
Coverage
Quick Quote

Make	Ford
Model	Coupe 2 Door Mustang
Year	1967

Is this vehicle equipped with an anti-lock braking system (ABS)?	No
What type of anti-theft device does this vehicle have?	None
Total mileage on this vehicle (odometer reading):	15,000 miles or more
Expected mileage next 12 months:	
How many miles is this vehicle driven to work, one-way?	
Is this vehicle equipped with air-bags?	None
Vehicle Information Number:	

<< Back   Next >>

Problems | Tasks | Properties | Web Browser | Image Preview | Snippets | Console

0 errors, 2 warnings, 0 infos (Filter matched 2 of 30 items)

Description	Resource	In Folder	Location
The import java.io.FileInputStream is never used	SubmissionServ...	WPFormsRedpaper/src/com/ibm/de...	line 14
The import forms.cam.itso.ibm.com.DB2Connectio...	SubmissionServ...	WPFormsRedpaper/src/com/ibm/de...	line 38

Figure 4-10 Example of a Workplace Form displayed within the Eclipse Platform

It is also possible to run the Workplace Forms Viewer as a plug-in within Eclipse. As of the 2.6 release, the Workplace Forms Designer is based on the Eclipse Platform.

This capability opens up a range of possibilities when one considers deploying forms and the Workplace Forms Viewer within a server-managed client infrastructure.

4.3.2 Data integration

Data integration is a broad topic and, depending on your definition of *data*, it can have a number of meanings. Typically, data refers to information that is inserted, entered into, or extracted from forms. However, from a transactional (content or records management) perspective, the form itself can be considered data. Let us examine the most common data integration scenarios.

Storage of form templates and completed forms

Workplace Forms are 100% XML documents. While this may sound obvious, it bears repeating, as the question often arises as to where form templates and completed forms are stored. Since the forms are XML, they are platform independent and can be stored on any file system, to a database, content or records management system. Most commonly, form templates are stored:

- Within the WebRoot of a Web or portal Application
- On the Web or portal Server file system
- On a remote, mounted file-system
- In DB2, Domino, or another database
- In Content Manager or Records Manager
- In portal Document Manager

Retrieval of form templates and persistence of completed forms typically occurs in the application tier. In J2EE-based solutions, this occurs in the servlet or portlet. In Notes/Domino applications, this occurs within the application itself.

Server-side prepopulation of form templates

This is the most common form of prepopulation. At the time of the request for the form template, data is acquired from one or more systems and inserted into the form. The Workplace Forms API provides us with a number of methods/functions that make data insertion easy.

At a high level, one can either set individual data elements within the UI or data model, or, more commonly, enclose an entire data instance within a form. If desired, one can prepopulate a form with multiple data instances from different sources.

From an end-user perspective, this happens behind-the-scenes. One simply clicks on a link or button to request a new form, and is presented with a prepopulated form (Figure 4-11).

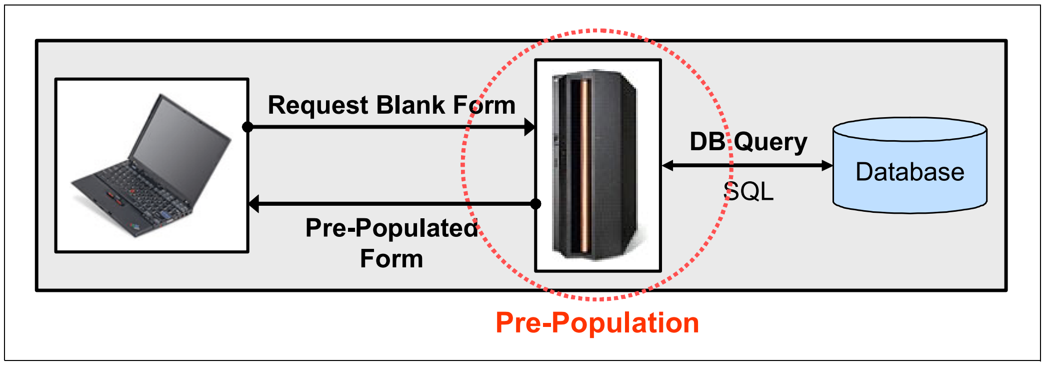


Figure 4-11 High-level example of server-side form template pre-population call flow

It is important to note that Workplace Forms based solutions rely on standard Web and portal Application authentication mechanisms to determine user identity and roles.

Real-time data ingestion via Web services

In some situations, data can be time sensitive, or the form may require results based on calculations and data contained by external systems. In this case, the suggested approach is to make Web service calls from the client-side (Figure 4-12). When designing Workplace Forms, one can embed Web service Definition Language (WSDL) files directly into the form itself and make Web service calls to:

- ► Submit/update information via an external service.
- ► Obtain data from an external service.
- ► Submit data for processing and obtain the result.
- ► Initiate or claim a task, or update the state of an existing task (Workflow Integration).

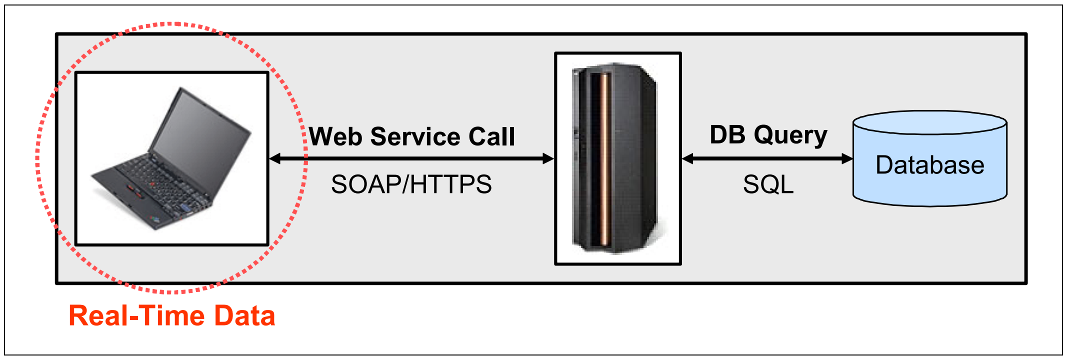


Figure 4-12 High-level example of client-side Web-service call flow

The Workplace Forms Viewer provides us with Web service support, so if you need to interact with a Web service when operating in Zero Footprint mode, then those calls will have to be made from the server side (server-to-service).

Attention: Refer to Appendix C, "Web services" on page 673, where we discuss in greater detail the integration of Workplace Forms with Web services, and also show how we implement Web services in XForms.

Real-time data ingestion via XForms submissions

Real-time data ingestion is typically done using Web services, as mentioned in the previous section. However, an easier method is to use XForms submissions. With XForms submits, we can basically submit XML fragments directly to any server-side process, including very simple servlets that can respond with another XML fragment. This allows us to do *Web service* like functions without the overhead of the Web service infrastructure (that is, no WSDL requires, no SOAP wrappers, and so on).

Therefore, in some cases it may be better to just code custom servlets to respond to XForms submits. In other cases, you may want services that are broadly available (for example, not just for your forms application) so Web services can cater for that functionality. See Figure 4-13.

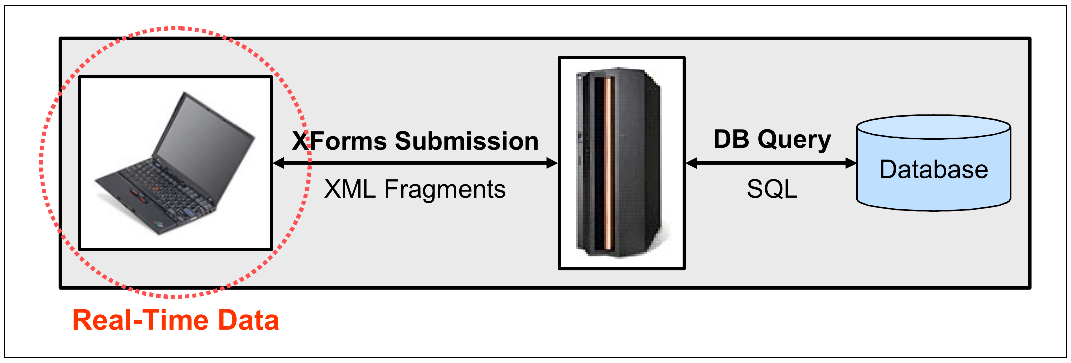


Figure 4-13 High-level example of client-side XForms submit call flow

Integration of an XML data instance with a line-of-business system

Workplace Forms provide us with an excellent means of capturing and validating data for systems that require human input. Many systems provide access via well-defined, XML interfaces, most often described by XML Schema. As touched upon previously, Workplace Forms provides us with an elegant way to provide complete, valid data to such systems.

Let us walk through the steps involved in performing this kind of straight-though integration.

1. Create the form (user interface, input validation logic, signatures) using the Workplace Forms Designer.
2. Obtain the XML Schema definition of the system to which we need to provide data.
3. Create a *prototypical* data instance — an instance that complies with this XML Schema. The Workplace Forms Designer allows you load in a schema, then with a single click create a prototypical instance that reflects that schema. From the Instance view, click the **Create a new Instance based on a schema** button to create this instance.
4. Using the Workplace Forms Designer, embed this data instance within the form's data model, providing it with a unique namespace and identifier.
5. Using the dialogs provided in Workplace Forms Designer, create *binds* between the elements within the data instance, the user interface (fields, comboboxes, and so on), and other data models as needed. The Workplace Forms Designer provides us with a visual (point-and-click) means to relate the UI and data model elements.
6. If desired, enclose the original schema to provide an additional level of validation of this data instance.
7. Save the form and deploy it to your users or into your Web/portal/Domino application.

When data is entered into the form by end users, the binds we have defined automatically propagate these values into the data instance that the target system consumes. If a portion of the form is filled out through pre-population, the data is often loaded directly into that data instance. If it is loaded into other data instances, we can again rely on binds to copy the data to the correct instance.

In terms of form processing and data integration, the high-level steps are:

1. Receive the form submission (typically HTTP Post or SOAP/HTTP).
2. Validate digital signatures, if desired, to ensure that the form has not been tampered with.

3. Using the Workplace Forms API, call the extractInstance() method to obtain the desired data instance.
4. Connect to the remote system and provide the valid, populated data instance.

Integration of multiple XML data instances to separate systems

A natural extension of integration to a single system is integration to multiple, disparate systems. Given the fact that Workplace Forms can simultaneously support more than one data instance, and store different representations of the same data in each instance (different date formats, for example, DD/MM/YYYY versus MM/DD/YY), one need only repeat the previously described steps for external XML Schema.

To make this more concrete, let us examine a specific example. The insurance industry in the United States of America has formed a group called ACORD that has defined a set of standard messages for insurance data and information processing systems. These messages are numbered and each has a different purpose. Let us take the example of a life insurance policy application form. This form contains three data instances:

- ACORD 111 compliant instance, used for prepopulating client data
- ACORD 103 instance, used for integration to underwriting
- XML Database compliant instance, used for reporting

Initially, the form is prepopulated by inserting a completed ACORD 111 instance. The data provided is propagated though to the form UI and the other data instances. As the end users fill out the rest of the form data, this information populates the rest of the required elements within the ACORD 103 and XML Database instance. Once data entry is complete, this form is submitted to the server, signatures are validated, and the data instances are extracted. The ACORD 103 instance is passed along to the underwriting system, and the XML database instance is provided to the database.

It is important to note that quite often the entire form document is also retained as a transaction record that can be audited at a later date if need be. Figure 4-14 shows a high-level example of form data integration to multiple systems, with submission of the completed form.

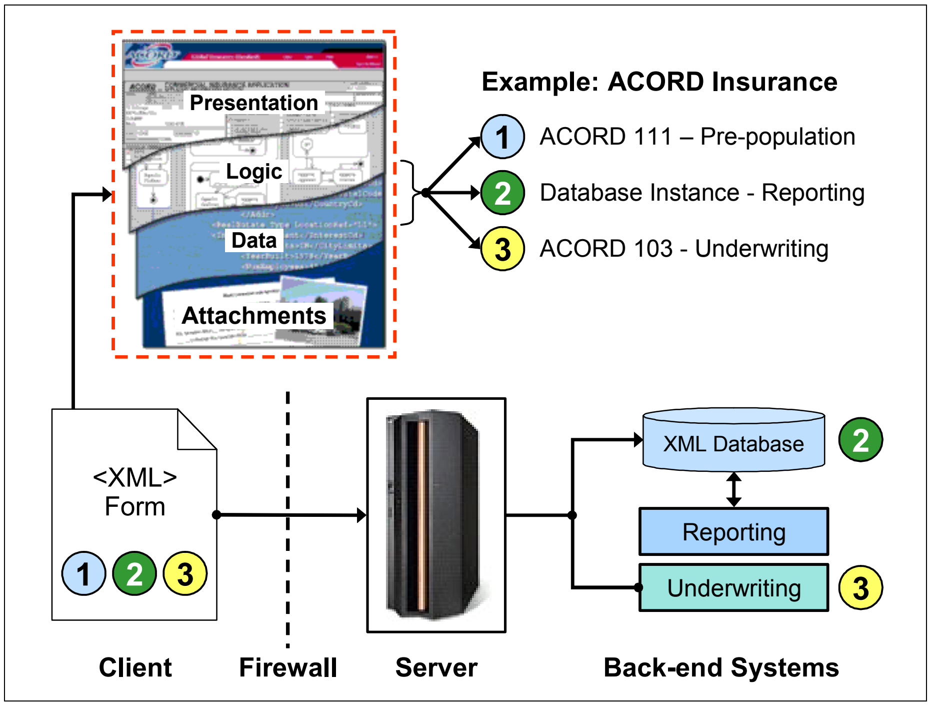


Figure 4-14 High-level example of form data integration to multiple systems

Real-time data integration

In certain situations, it is desirable to provide (or obtain data) in real time. Client-side Web services provide us with the best means of doing so. However, alternate approaches include round-trip submission of the form to the server, or the use of an IFX to handle socket or stream-based communications with external systems.

- Client-side Web service integration: The use of Web service calls directly from the form itself. This requires the Workplace Forms Viewer.
- Server-side Web service integration: This is integration with external Web services in the application tier, typically within a servlet or portlet. These interactions can be performed either at the time of form template request, for prepopulation, part-way though the form filling process, based on an event (such as one pressing a button) within a form that triggers a round-trip submission, or on processing of a completed and submitted form.
- XForms submission integration: This is integration using XForms submission that allows mid-population using simple servlets without the Web services overhead.

4.3.3 Process integration

Workplace Forms provides us with a high degree of flexibility with regards to process integration. This results, in part, from the fact that Workplace Forms is a component technology that is designed to overlay onto existing customer infrastructure investments (application or portal server, workflow, database, content or records management systems, and so on). Additionally, architects have a high-degree of freedom with regard to how much (or little) business logic is built into the form, and how much is managed externally.

For enterprise applications, the use of a process-oriented or workflow product is often essential. Examples include, but are not limited to:

- WebSphere Process Server
- WebSphere MQ Workflow
- WebSphere Portal Document Manager
- Content Manager Workflow

From a high-level perspective, there are several standard models for form interactions with process or workflow engines, as explained in the following sections.

Initiation of a task or workflow based on form submission or completion

In this case, data collected within a Workplace Form is used to initiate or kick-off a new process.

Form-based data collection as a human-task within a workflow

As part of a human task, data is collected within a form. On submission, the form data is processed, the task state is updated accordingly, and the process continues.

Calls to process server for real-time process interaction

In some situations, real-time business rule processing is important. One example may be the routing of a form for approval to an individual based on business logic, and role-based task capabilities, using data collected within the form as decision criterion. Web service calls could be made using either the client-side or server-side models that we discussed earlier.

4.3.4 Security context integration

Considered at a high-level, forms run within the security context of the user and host environment. For example, if a user launches a form off his desktop, then the form runs with all of the privileges and rights associated with that user's account on his operating system. If, however, a user accesses a form through his Web browser, then there are several different security implications. First, if the Web site is secured and requires authentication, then the Workplace Forms Viewer runs within the context of the user's session with the server. Session time-out handling should be taken into account, for example, if one expects users to complete, then submit a lengthy form. Second, local privileges may be restricted based on the *sandbox* to which the Web browser is restricted.

4.3.5 Client-side device/hardware integration

The Workplace Forms Viewer provides us with an extension point that allows us to integrate with a broad range of hardware and systems. This extension interface is called the *Function Call Interface* (FCI), and individual extensions or extension packages are often referred to as *Internet Form Extensions* (IFX). IFX also provide *black box* functions that take input and return output to the form, and can also provide *form handling* functionality, such as encrypting a form before it is submitted.

The FCI Library is a collection of methods for developing custom-built functions that form developers may call from within Workplace Forms. By allowing one to create custom functions, it is possible to extend the capabilities of forms without requiring an upgrade to your forms software. IFX can be installed onto the end user's systems, or embedded within Workplace Forms. In addition to providing individual functions to form designers, one can also specify how and when the functions are used. For example, it is possible to specify that a function should run when a form opens, when it closes, and so on.

Using C or Java IFX, it is possible to interface with the local file system and device drivers, create socket-based connections, and perform almost any action that you can implement in the programming language that you have selected. Examples of this could include biometric devices and GPS hardware integration.

IFX can be used in the Webform Server as well. Once an IFX is running on a Webform Server, form application developers gain a whole new level of architecture possibilities. For example, normally a client machine's Viewer never makes database calls containing confidential data across a firewall. However, if those database calls are made within an IFX that is running on the Webform Server, now it is the actual Translator (which is part of the Webform Server behind the firewall) making those calls, so those database calls are now secure and behind the firewall, and only the results of those calls show up in the form on the client's machine.

For extensive, detailed information about the FCI, refer to the Workplace Forms API documentation (C and Java versions):

http://www-128.ibm.com/developerworks/workplace/documentation/forms/

4.4 Integration points summary

To sum up, here are the key integration points for Workplace Forms:

- The form data model
- The Workplace Forms Viewer, running as a plug-in within a supported browser or Eclipse
- The Workplace Form, rendered into HTML within a compliant browser
- Web services on the client
- Using XForms submissions
- The Workplace Forms Viewer FCI/IFX

Although it may sound simple, the implications of the first point are significant. The Workplace Forms API gives us the ability to quickly and easily move data into or out of a form's data model, and because of the support for arbitrary data instances, this gives us broad latitude at design time. For example, we could *push* attachments into the form data model as part of prepopulation. In a portal environment, we can prepopulate generated URI, used for form submission back to the portlet. Alternately, the data model can enclose BPEL that contains the current state of the form or even logos and branding, depending on the role of the end user/customer who is accessing the form.

4.5 Partitioning of features and functionality

Creating standalone forms is one thing, but when designing an overall eForm solution or process, we are faced with numerous design-time trade-offs. As with other projects, a needs assessment or requirements specification is essential to set parameters for partitioning of where specific features or functionality are addressed.

For example, using the stateful nature of the form in conjunction with the compute system, it is possible to construct a state-machine based on conditional logic, and to tie it to the data entered into the form. This gives us basic, in-form workflow capabilities to set end-points for routing via e-mail, submission, and so on. Often, however, clients have existing investments in enterprise grade workflow products such as WebSphere Process Server or MQ Workflow, which give us much more robust, centralized capabilities. The use of Workplace Forms in conjunction with these products is both expected and intended. From an architectural perspective, this gives us freedom with regard to how we partition functionality.

At one extreme, one can build forms that contain no business logic at all, forms that instead rely on real-time interaction with a process engine for all decisions and state information. At the other extreme, one can create forms that operate independently and contain complex state-machines, managing all aspects of their own behavior and routing. An example of a Workplace Form as a standalone application is the game of BlackJack, shown in Figure 4-15.

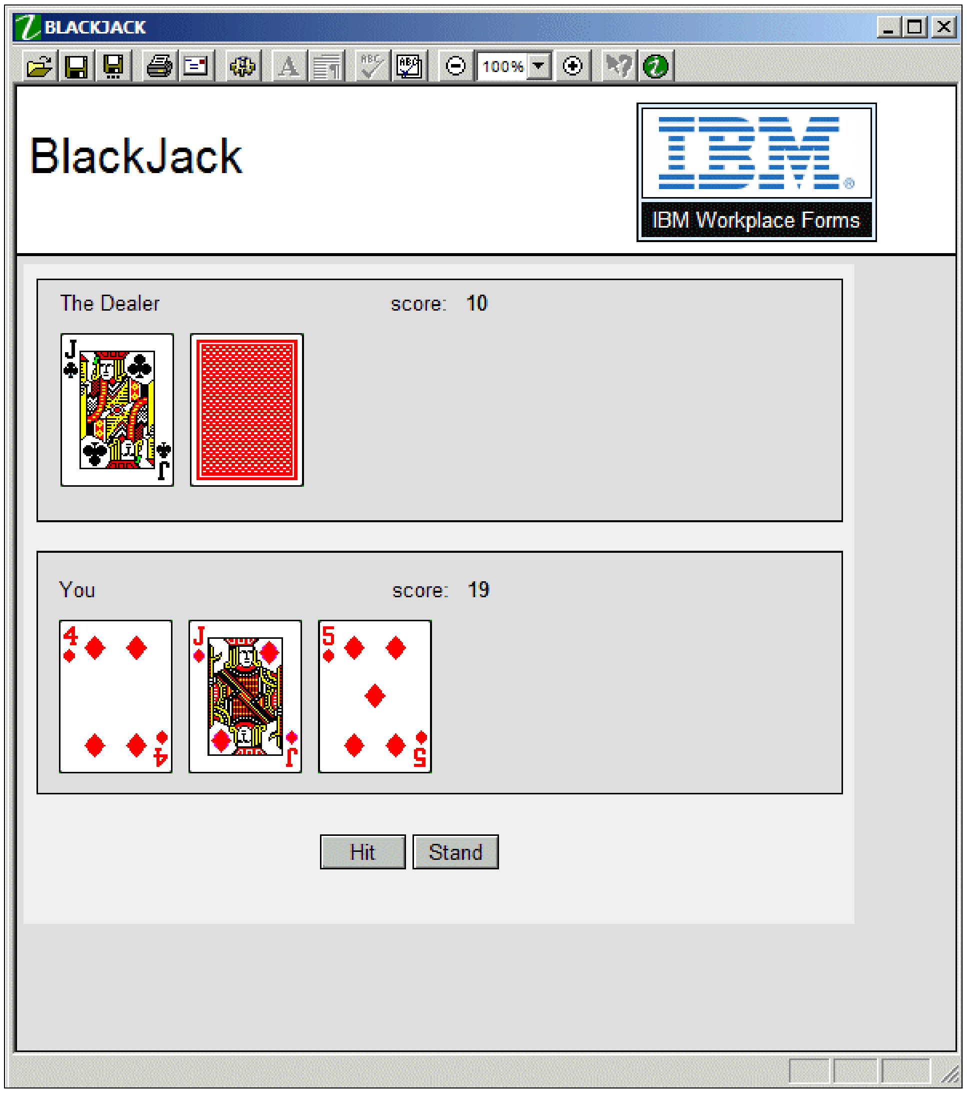


Figure 4-15 Example of an application - BlackJack - implemented within a Workplace Form

When designing the example created for this book, we made the decision to show as much form functionality as possible. As such, we decided to manage all state information within the form itself. If such a solution were implemented in a production environment, we might wish to repartition the solution to move much of the business logic to the application tier (Process Server or Content Manager Workflow, for example).

4.6 Introduction to actual integration scenarios

Throughout the remainder of this book, we provide hands-on information about how to build a sample scenario application, beginning first with a standalone J2EE Workplace Forms application, then illustrating how to integrate this application with WebSphere Portal, Lotus Domino, and IBM DB2 Content Manager.

The base scenario application is based on a sales quotation approval application, granting approval for price quotations and discounts for customers. The application has built-in business logic and workflow, determining which quotations and discounts must be granted either manager or director level approval based upon the price of the sale. This sample scenario application is described in much greater detail beginning in 5.1, “Introduction to the scenario” on page 174.

5

Building the base scenario: stage 1

In this chapter we continue to build on the skills learned in 2.4, “Form Design basics” on page 51, by creating a new form that is the foundation scenario for the remainder of this book. The form depicts a sales quote process that utilizes a workflow solution, and requires signatures from multiple roles. Because this form covers multiple new form design features and requires backend integration, it is built in two stages: stage 1 and state 2.

- Stage 1: Basic form with dynamic items, binds, and computes
- Stage 2: Back end system integration (See Chapter 6, “Building the base scenario: stage 2” on page 367.)

The base scenario comprises the following components:

- A form that collects the relevant data
- A servlet that processes the form
- Several JSPs to start the sales quote process and to view forms

Note: The code used for building this sample scenario application is available for download. For specific information about how to download the sample code, refer to Appendix D, “Additional material” on page 693.

Note: All specific examples shown and used when building the sample scenario application are based on the code base for IBM Workplace Forms Release 2.6.1.

5.1 Introduction to the scenario

As we have discussed in the opening chapter, much of the business value from Workplace Forms is realized when converting paper-based forms into electronic forms. This conversion allows a process to be formalized by capturing data through a structured front end (the electronic form) and incorporating formal business logic, business rules, workflow, and security. Ad hoc processes become formalized, the method to capture data becomes consistent, and opportunities for efficiently processing and leveraging this data are exposed.

For this book we create a base scenario application that serves as a foundation example throughout the book. The scenario is based on a sales quotation approval application, granting approval for price quotations and discounts for customers. The application has built-in business logic and workflow that determines which quotations and discounts must be granted, and the level of approval required based upon the sale price.

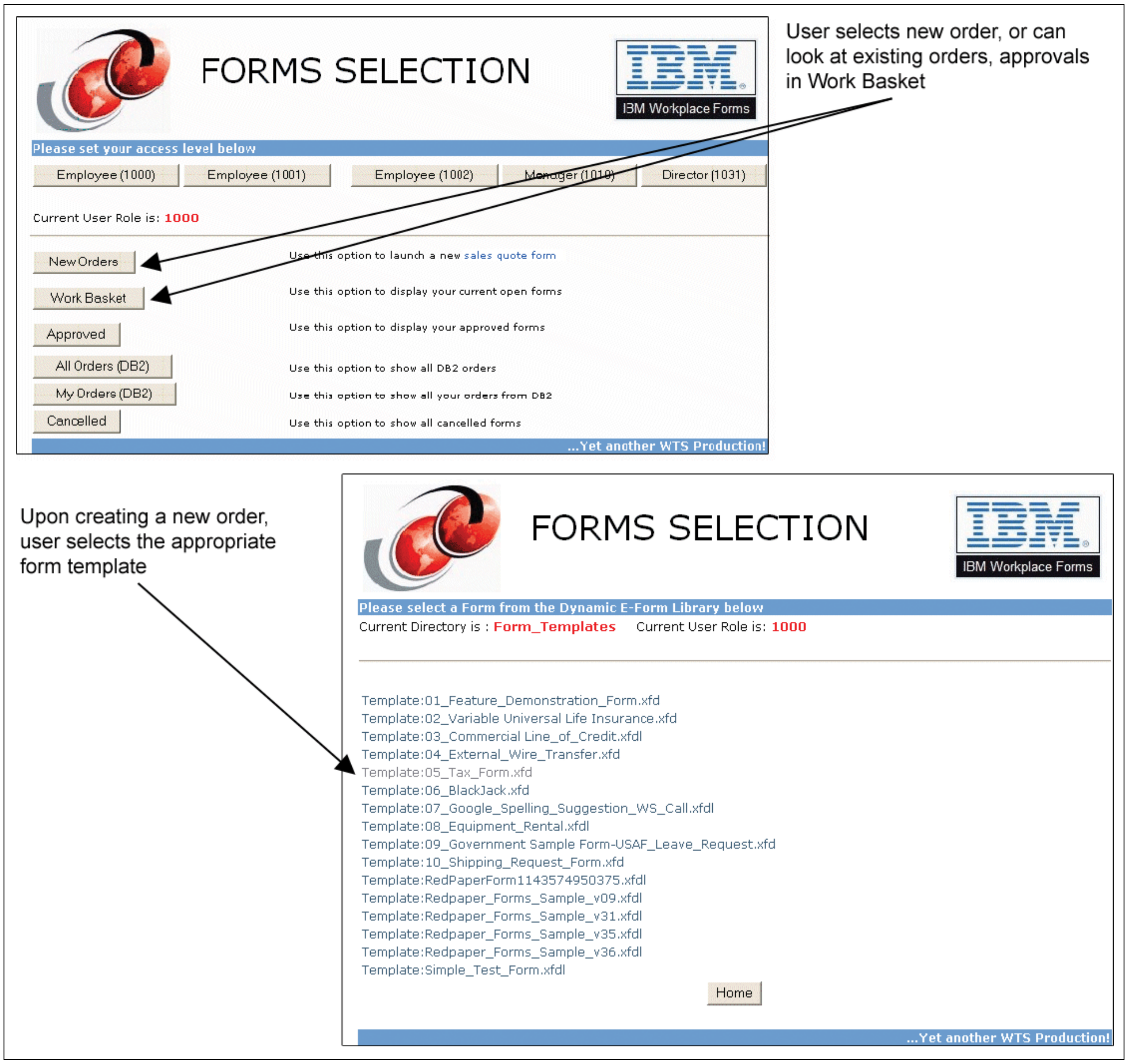
In stage 1 we do not integrate with a backend system or do any prepopulation in the form. However, we design the form with an eye towards stage 2 of the form development cycle. For example, we implement a simple workflow of different roles that have to sign the form depending on the total amount of the sales quote. Also upon completion, the user submits the form to a servlet that does further handling of the form such as:

- Controlling access to the form
- Saving the form to the file system in dedicated folders according to the workflow
- Processing the workflow by presenting a workbasket to the respective roles

5.1.1 Review from an end-user perspective

This section describes the key parts of the application from an end-user perspective. Note that the application is role based, and the options available for each user are different, depending upon whether they are an employee user (such as a sales person), a manager, or a director. Only managers and directors have the ability to make formal approvals.

Upon logging in, the user is presented with choices related to the task she needs to accomplish. The user can either create a new order for a quotation or view the workbasket to view pending required approvals, or any other forms which have been approved or rejected. (See Figure 5-1.)


User selects new order, or can look at existing orders, approvals in Work Basket
FORMS SELECTION
IBM Workplace Forms
Please set your access level below
Employee (1000)
Employee (1001)
Employee (1002)
Manager (1010)
Director (1031)
New Orders
Work Basket
Approved
All Orders (DB2)
My Orders (DB2)
Cancelled
...Yet another WTS Production!
Upon creating a new order, user selects the appropriate form template
FORMS SELECTION
IBM Workplace Forms
Please select a Form from the Dynamic E-Form Library below
Home
...Yet another WTS Production!

Current User Role is: 1000

Use this option to launch a new sales quote form
Use this option to display your current open forms
Use this option to display your approved forms
Use this option to show all DB2 orders
Use this option to show all your orders from DB2
Use this option to show all cancelled forms

Current Directory is : Form_Templates   Current User Role is: 1000

Template:01_Feature_Demonstration_Form.xfd
Template:02_Variable Universal Life Insurance.xfd
Template:03_Commercial Line_of_Credit.xfdl
Template:04_External_Wire_Transfer.xfd
Template:05_Tax_Form.xfd
Template:06_BlackJack.xfd
Template:07_Google_Spelling_Suggestion_WS_Call.xfdl
Template:08_Equipment_Rental.xfdl
Template:09_Government Sample Form-USAF_Leave_Request.xfd
Template:10_Shipping_Request_Form.xfd
Template:RedPaperForm1143574950375.xfdl
Template:Redpaper_Forms_Sample_v09.xfdl
Template:Redpaper_Forms_Sample_v31.xfdl
Template:Redpaper_Forms_Sample_v35.xfdl
Template:Redpaper_Forms_Sample_v36.xfdl
Template:Simple_Test_Form.xfdl

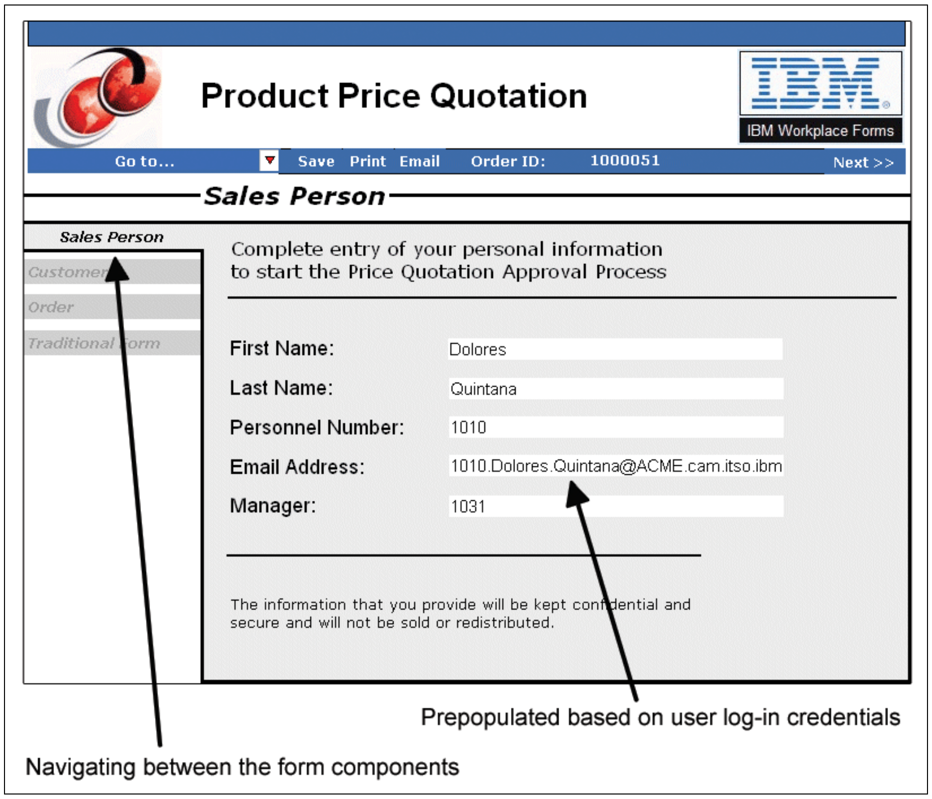
Figure 5-1 Logging in to create a new order

From within the sales quotation form template, the end user enters and validates data related to:

- Sales person information
- Customer information
- Product information

Figure 5-2 illustrates the form component pertaining to the sales person data.

Note: Sales person data for this form is prepopulated based on user authentication credentials, using data from the corporate directory.



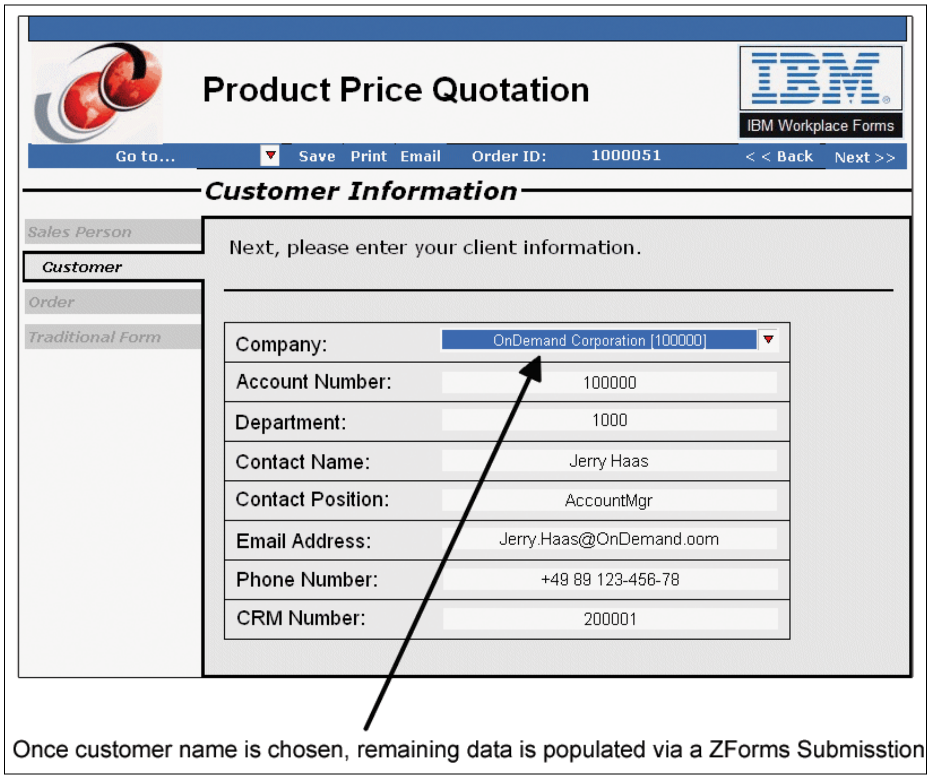
Complete entry of your personal information to start the Price Quotation Approval Process

First Name:	Dolores
Last Name:	Quintana
Personnel Number:	1010
Email Address:	1010.Dolores.Quintana@ACME.cam.itso.ibm
Manager:	1031

The information that you provide will be kept confidential and secure and will not be sold or redistributed.

Figure 5-2 Sales person data

When the users clicks the **Customer** component of the form (see Figure 5-3), they must select the customer name, and the remaining data fields are populated automatically.



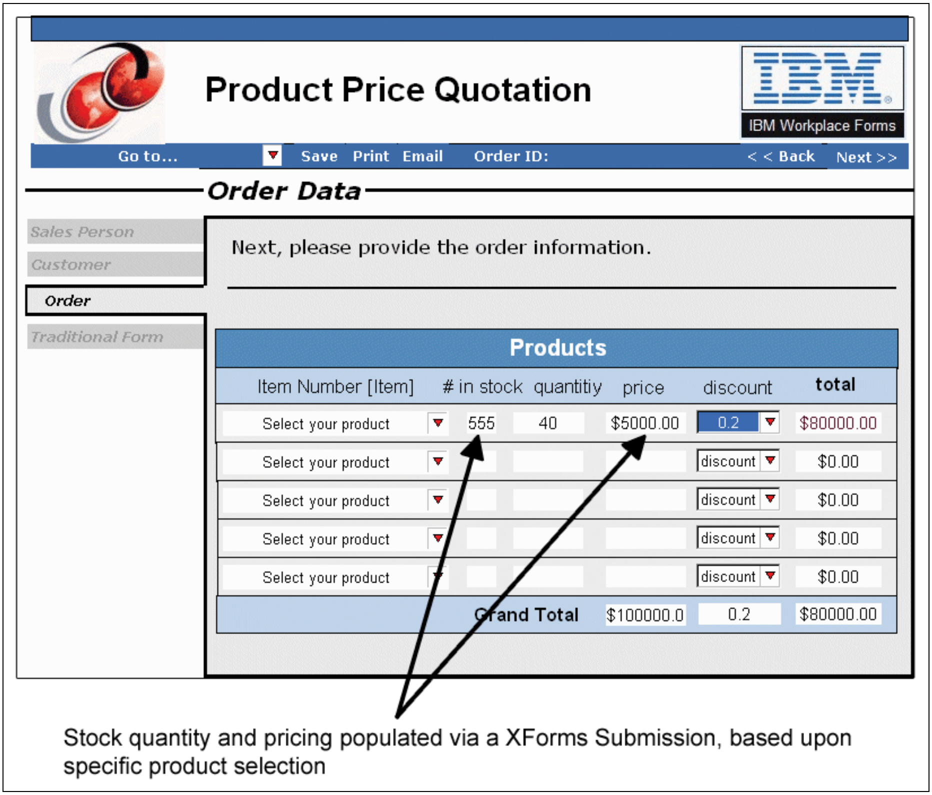
Next, please enter your client information.

Company:	OnDemand Corporation [100000]
Account Number:	100000
Department:	1000
Contact Name:	Jerry Haas
Contact Position:	AccountMgr
Email Address:	Jerry.Haas@OnDemand.com
Phone Number:	+49 89 123-456-78
CRM Number:	200001

Once customer name is chosen, remaining data is populated via a ZForms Submisstion

Figure 5-3 Customer information - prepopulated via an XForms submission

Finally, the end user can enter information specific to the product (see Figure 5-4). Total pricing is automatically calculated.



Next, please provide the order information.

Products

Item Number [Item]	# in stock	quantitiy	price	discount	total
Select your product	555	40	$5000.00	0.2	$80000.00
Select your product				discount	$0.00
Select your product				discount	$0.00
Select your product				discount	$0.00
Select your product				discount	$0.00
		Grand Total	$100000.0	0.2	$80000.00

Stock quantity and pricing populated via a XForms Submission, based upon specific product selection

Figure 5-4 Entering specific data about the product

Once the form is completed, it can be submitted for approval.

The following business logic is applied to this scenario:

- $0 → $10,000: pre-approved
- $10,001 → $50,000: manager approval required
- $50,001 or higher: director approval required

Upon submitting the form, it then routes via workflow to the appropriate work basket for further processing upon approval.

Throughout the remainder of this chapter, together with the steps outlined in Chapter 6, “Building the base scenario: stage 2” on page 367, we provide you with step-by-step guidance on how to build this scenario application.

5.2 Building stage 1

In building the electronic forms-based application, the value of converting a paper-based form to an electronic forms application is demonstrated. A two-stage approach is taken. In this chapter we cover stage 1 and provide step-by-step instructions to create an XForms Model driven form with basic interactions. In Chapter 6, “Building the base scenario: stage 2” on page 367, we show more advanced integration capabilities. The diagram in Figure 5-5 provides an overview of the key steps involved in building the base scenario. As you can see in the diagram, this chapter focuses on:

1. Building and designing the form template
   a. Analyzing the original paper-based form
   b. Defining our XForms Model
   c. Creating the layout and input items
   d. Adding calculations and logic
2. Building the servlet
3. Building the JSPs
   a. Security access
   b. Form access

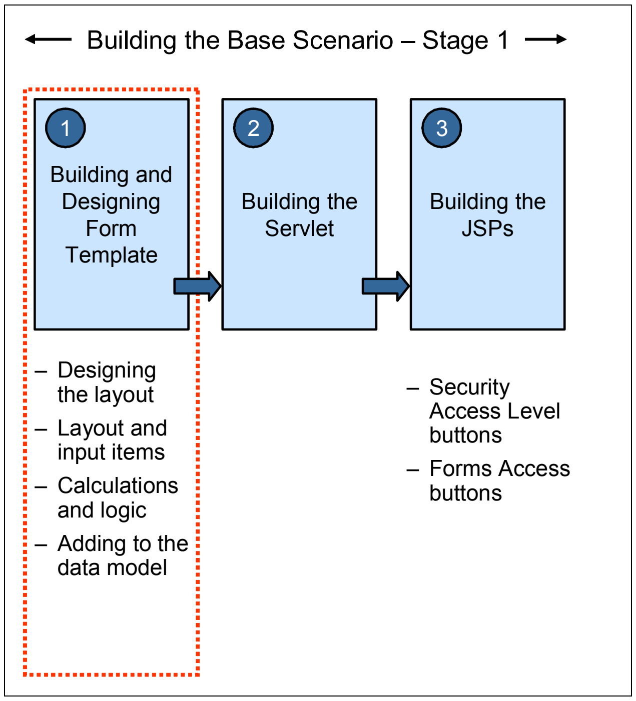


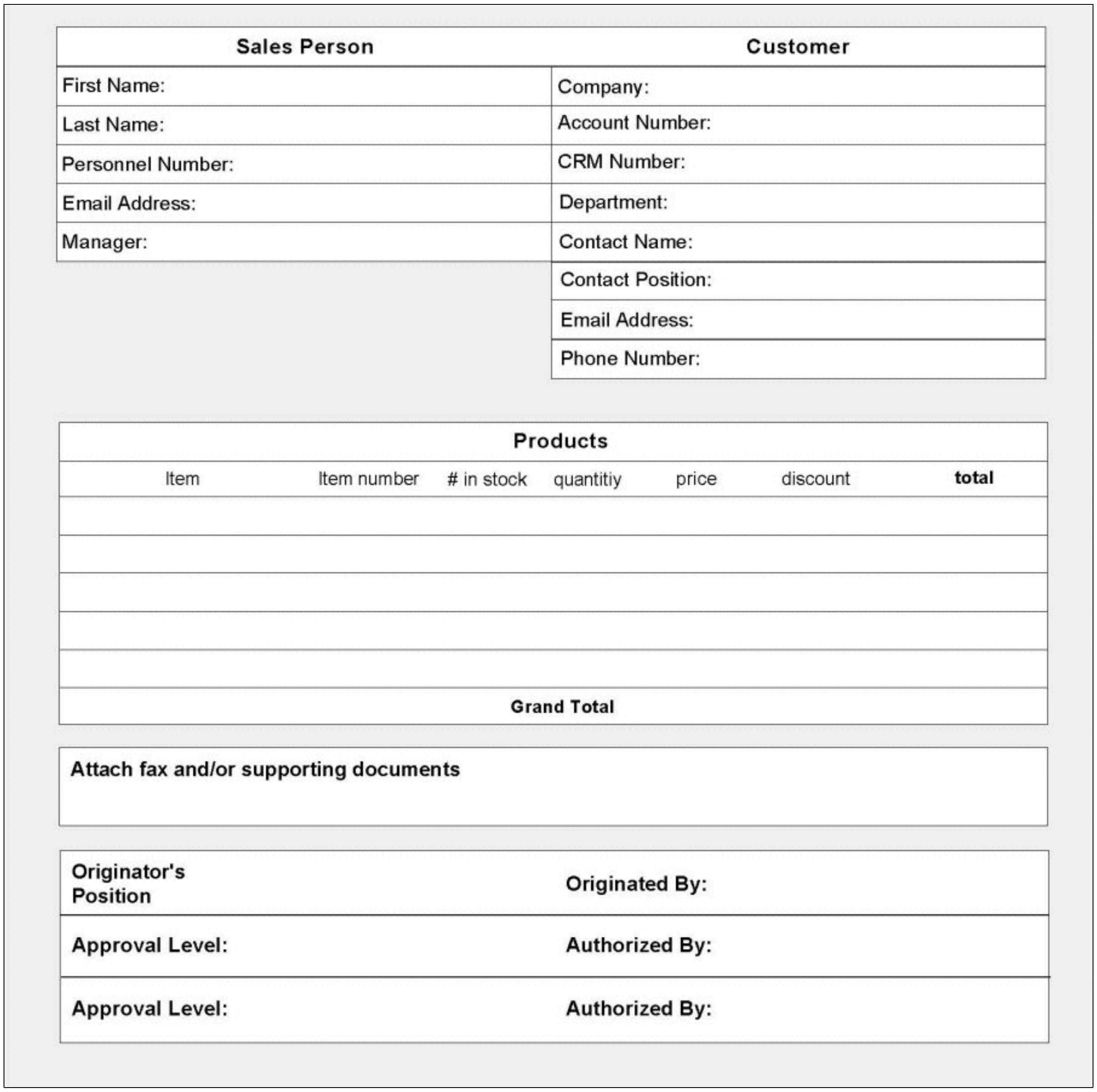
Figure 5-5 Overview of major steps involved in building the core base scenario application

In this section we cover the following topics:

- Analyzing the original paper-based form
- Form data
- Business forms
- User interface

5.2.1 Analyzing the original paper-based form

The first thing that should be done when approaching the recreation of an existing form as a new e-form is to consider how it will be used and how it might be improved. Figure 5-6 provides us with an image of the original paper-based form that we will convert to an e-form.



Sales Person	Customer
First Name:	Company:
Last Name:	Account Number:
Personnel Number:	CRM Number:
Email Address:	Department:
Manager:	Contact Name:
	Contact Position:
	Email Address:
	Phone Number:

Products						
Item	Item number	# in stock	quantitiy	price	discount	**total**
			Grand Total			

Attach fax and/or supporting documents

Originator's Position	**Originated By:**
Approval Level:	**Authorized By:**
Approval Level:	**Authorized By:**

Figure 5-6 Original paper-based form used for generating a sales quote approval

Ultimately, the goal of any form is the proper collection and distribution of information, but keep in mind that the end user is the primary user of your e-form. Workplace Forms provides many features and functions that can be used to enhance the value of any e-form. If there is an opportunity to enhance back-end system integration or improve the end-user experience then it should be taken advantage of. There are three primary components to any form that should be taken into consideration:

- What data elements will need to be shared with other systems?
- What process is used to meet the business needs?
- How should the e-form application be presented to the end user?

5.2.2 Form data

Knowing the data integration requirements in advance provides a basis for how the form is developed and can be a huge time saver, especially when you consider what type of data model is used. There are significant design differences between a form that has support for an XForms Model and one that is a pure XFDL form. Adding XForms support to a form allows the designer to use different form items, functions, binds, and computes.

We know in advance that the form needs to be able to send and receive information from a DB2 database, and be able to submit the form to different back-end systems. An illustration of possible integration with other systems that we must consider for our form includes WebSphere Portal, Content Manager, and Domino. Detailed discussion of these is provided in subsequent chapters.

Figure 5-7 illustrates the sample application within the context of a three-tier architecture. While the basis of this scenario is built using J2EE, different integration techniques/ touchpoints with other products are examined in subsequent chapters.

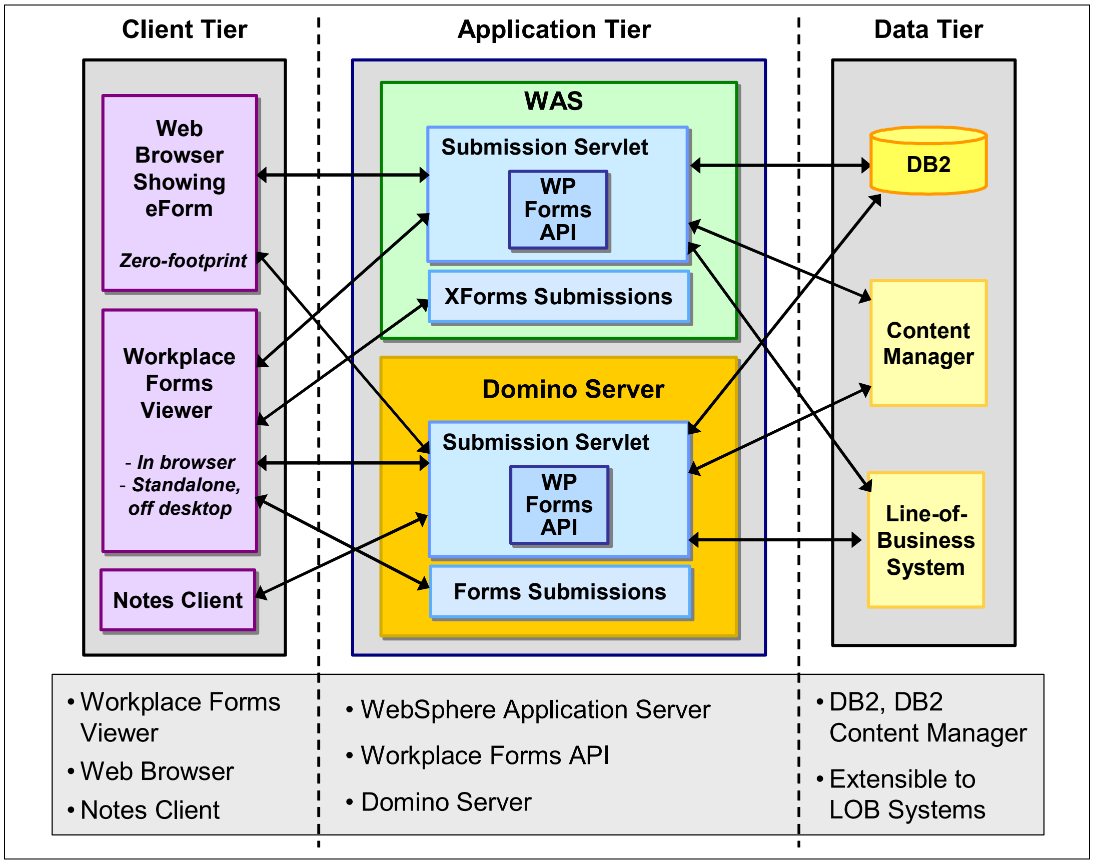


Figure 5-7 Illustrating the scope of the sample application within context of a three-tier architecture

5.2.3 Business forms

The foundation for the scenario is a paper-based form (illustrated in Figure 5-6 on page 180), which serves as the starting point for creating a sales quote approval. Using the *paper-based* form, the process for obtaining a sales quote approval goes as follows:

1. The sales representative fills in the basic information such as name, manager, customer name, account number, and information about the product, quantity, and proposed quotation pricing.
2. Once the information is filled in, the form is faxed to a manager for review. The manager reviews the information, verifies the details of the customer account, and then signs approval.
   a. In many cases, numerous phone calls and e-mail exchanges between the manager and sales representative might be required to discuss details and confirm the proper quotation.
   b. Once the manager has approved a specific quotation, the signed form is faxed back to the sales representative.
3. If the sales quotation leads to an actual sale, the form is then faxed to a customer service person in the sales department, who then *manually* enters the information into the main sales and inventory system.

As you can imagine, the process for obtaining a sales quotation approval using this paper-based method is considered inefficient and burdensome. Responses and approvals from management could easily be delayed, and the business logic/rules applied for approving specific quotations are not always consistent. By converting this sales quotation approval process from a paper-based form to an *electronic form-based* application with formal business logic, workflow, and back-end integration with other systems, the entire process can be made much more efficient.

Based on the process described above, we can create a logical diagram illustrating the workflow and business logic required for our form. Figure 5-8 shows an overview of the workflow and business logic contained within the application.

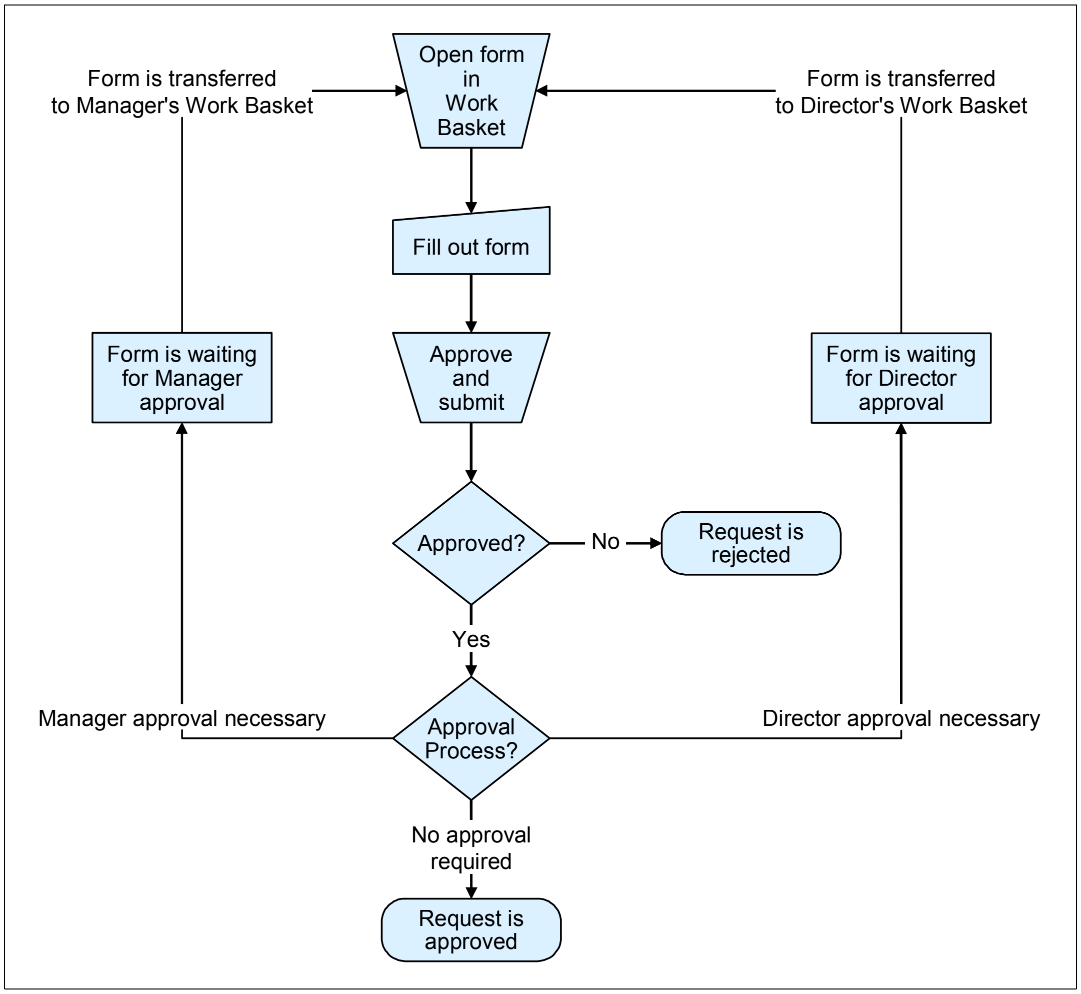

Open form in Work Basket
Form is transferred to Manager's Work Basket
Form is transferred to Director's Work Basket
Fill out form
Form is waiting for Manager approval
Approve and submit
Form is waiting for Director approval
Approved?
No
Request is rejected
Yes
Manager approval necessary
Approval Process?
Director approval necessary
No approval required
Request is approved

Figure 5-8 Overview of workflow for sample application

We now know that the following features and functionality of IBM Workplace Forms can be used to provide us with a solution to the workflow and business rule requirements:

- Approval for quotation and discounts for customers
- Prepopulation of data:
  - From servlet via Forms Server API
  - From XForms submissions
- Business logic
- Workflow
- Signatures
- Submit to servlet
- Extract data and store form to DB2

5.2.4 User interface

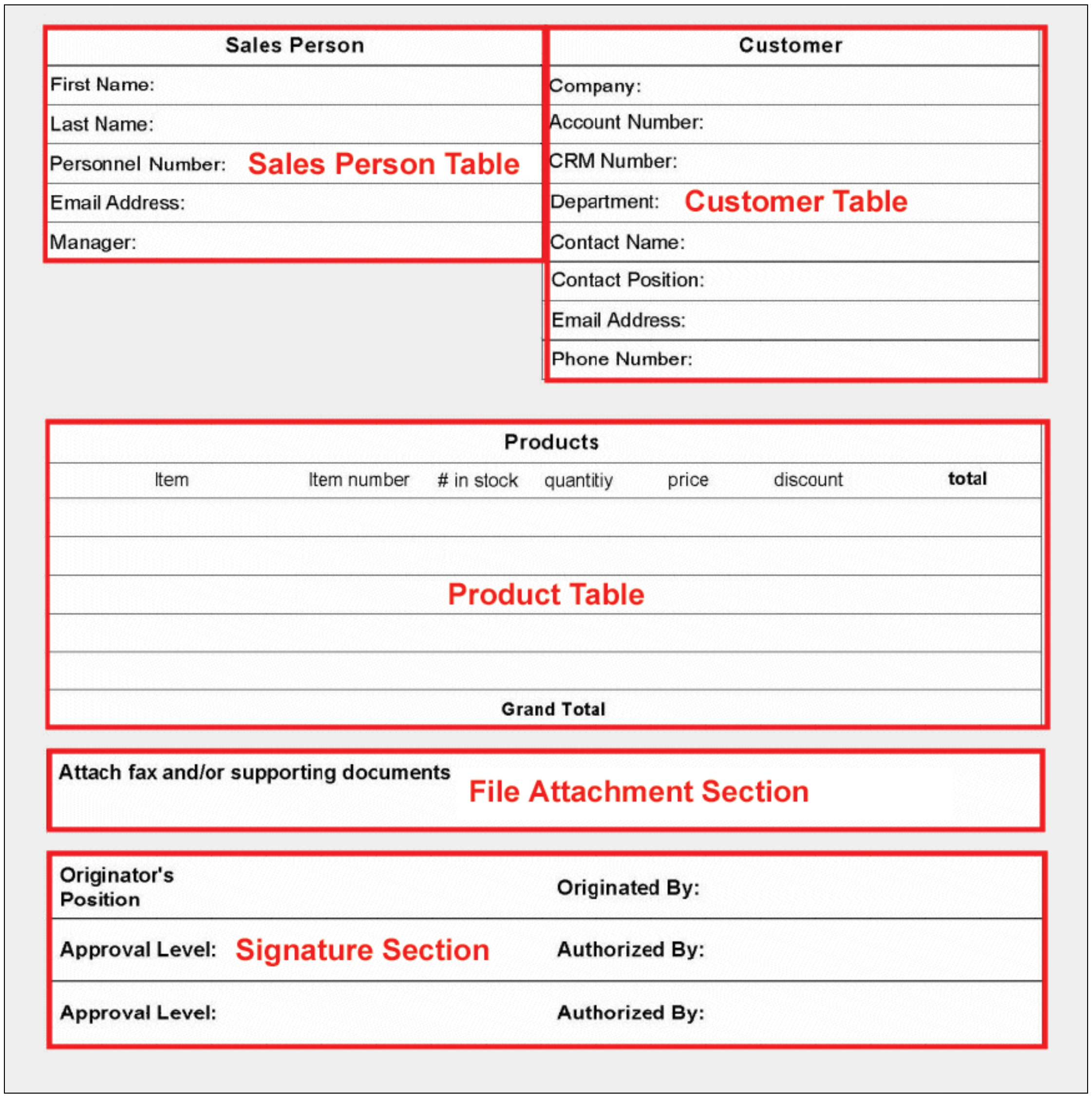
It can be difficult for users to enter complex data into crowded traditional forms, especially if they are unfamiliar with the rules governing the data entry. The end-user experience can be vastly improved by creating an interface with multiple pages that break out form sections by topic. This approach to form development is often referred to as creating a *wizard* form.

Where traditional e-forms can be crowded and unstructured with little room for user instruction, wizard pages can be used to guide the user through the data entry process in a logical and controlled manner that eliminates redundancy and automatically processes the information collected. Once the data is collected in the e-form application, it can then be processed by form logic, and displayed in the original format of the traditional form in a more concise business-friendly format.

The use of wizard pages within IBM Workplace Forms is a common practice used to make the entry of data an easier process. Here are some benefits of using wizard pages:

- Wizard pages are generally smaller, fit to the screen, and easier to read, with no scrolling required. Page real estate is not an issue, as it can be with some dense traditional forms.
- They allow the user to enter information once and have it displayed in multiple locations on the traditional form, making data entry more consistent and decreasing the risk of errors.
- They provide a flexibility that is not present in a traditional form. The ability to add labels to make the form easier to read, expand acronyms, and add code definitions that normally would not fit on a traditional form. If a user does not know the business rules needed to fill in a form, wizard pages can be used to guide them through the process in an intuitive manner.
- The appearance and formatting of fields on the traditional form can be changed based on user input in wizard pages. For example, fields on the traditional form might be active or not, based on the response entered on a wizard page. This would be especially useful when using Workplace Forms Webform Server, as dynamic updating of the form is only possible through either a page refresh or a page flip.
- Wizard pages allow for a role-based display of fields. It can be used to walk a user through portions of the form without displaying fields that do not affect him. This allows instructions to be displayed without overcrowding the traditional form.
- Users can *enter* multiple values on a wizard page and have the single calculated value based on that input displayed in the traditional form. This can save valuable real estate. (Note that this methodology restricts two-way data transfer between the traditional form and wizard.)
- Users can *select* multiple values from a pop-up list on a wizard page and then have only codes representing those values concatenated in a single field on the traditional form. This not only saves real estate on the traditional form, but increases the clarity of the possible selections by providing more information than a code allows. (Note that this methodology restricts two-way data transfer between the traditional form and wizard.)
- Users can also have multiple wizard page fields concatenated into a single field on the traditional form, again saving form real estate.

We know in advance that the original form has to be reproduced, so we have to create one page that represents it as closely as possible without sacrificing functionality. This is often called the form *template* page. As we examine this original paper-based form, we can see that there is room for improvement. Breaking down the form as shown in Figure 5-9 shows us that there are three primary data entry tables, and two additional sections required to process the form.



Sales Person	Customer
First Name:	Company:
Last Name:	Account Number:
Personnel Number:	CRM Number:
Email Address:	Department:
Manager:	Contact Name:
	Contact Position:
	Email Address:
	Phone Number:

Products

Item	Item number	# in stock	quantitiy	price	discount	total
Grand Total						

Attach fax and/or supporting documents

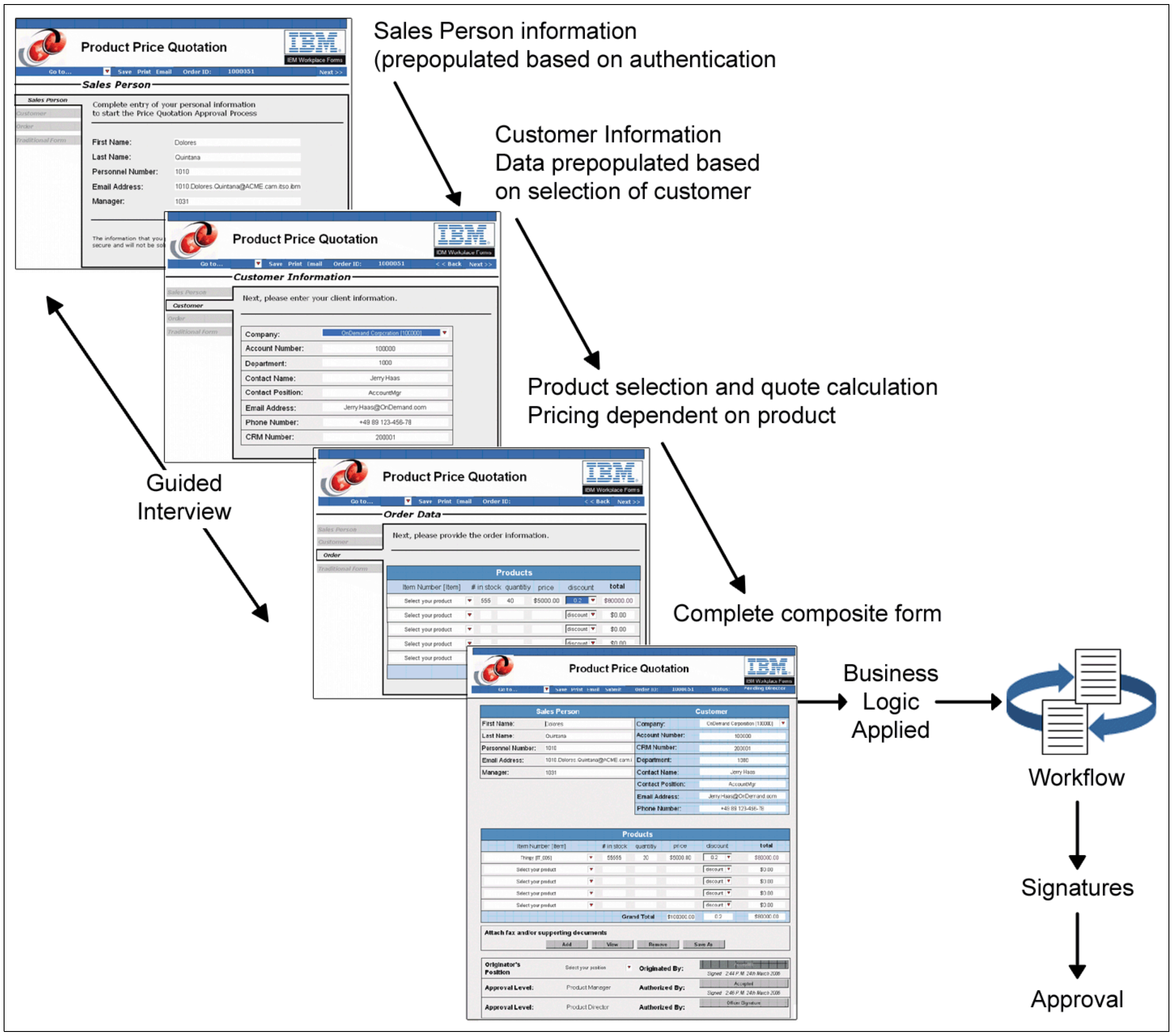
Originator's Position	Originated By:
Approval Level:	Authorized By:
Approval Level:	Authorized By:

Figure 5-9 Form breakdown

The three data entry tables are the primary data collection elements of this form and therefore the primary candidates for wizard pages that can be used to instruct the user through the process of completing this form. Even though we could also design wizard pages for the other two sections, it is not necessary since they are simple form elements that are more about form processing and completion than data collection. We keep those sections on the form template page. With this understanding, we know that our form contains four pages:

- Form template page that represents the original form
- Sales Information wizard page
- Customer Information wizard page
- Product Information, or Order Detail, wizard page

Figure 5-10 provides a conceptual overview of the application from an end-user perspective.



Order ID: 1000051

Sales Person

Complete entry of your personal information to start the Price Quotation Approval Process

First Name:	Dolores
Last Name:	Quintana
Personnel Number:	1010
Email Address:	1010.Dolores.Quintana@ACME.cam.itso.ibm
Manager:	1031

The information that you … secure and will not be so…

Customer Information

Next, please enter your client information.

Company:	OnDemand Corporation [100000]
Account Number:	100000
Department:	1000
Contact Name:	Jerry Haas
Contact Position:	AccountMgr
Email Address:	Jerry.Haas@OnDemand.com
Phone Number:	+49 89 123-456-78
CRM Number:	200001

Order Data

Next, please provide the order information.

Item Number [Item]	# in stock	quantity	price	discount	total
Select your product	555	40	$5000.00	0.2	$80000.00
Select your product				discount	$0.00
Select your product				discount	$0.00
Select your product				discount	$0.00
Select your product					

Order ID: 1000051 Status: Pending Director

Sales Person		Customer	
First Name:	Dolores	Company:	OnDemand Corporation [100000]
Last Name:	Quintana	Account Number:	100000
Personnel Number:	1010	CRM Number:	200001
Email Address:	1010.Dolores.Quintana@ACME.cam.i	Department:	1000
Manager:	1031	Contact Name:	Jerry Haas
		Contact Position:	AccountMgr
		Email Address:	Jerry.Haas@OnDemand.com
		Phone Number:	+49 89 123-456-78

Item Number [Item]	# in stock	quantity	price	discount	total
Thingy [IT_005]	55555	20	$5000.00	0.2	$80000.00
Select your product				discount	$0.00
Select your product				discount	$0.00
Select your product				discount	$0.00
Select your product				discount	$0.00
		Grand Total	$100000.00	0.2	$80000.00

Attach fax and/or supporting documents

Originator's Position	Select your position	Originated By:	Accepted Signed 2:44 P.M. 24th March 2006
Approval Level:	Product Manager	Authorized By:	Accepted Signed 2:46 P.M. 24th March 2006
Approval Level:	Product Director	Authorized By:	Officer Signature

Figure 5-10 Overview of base scenario application

The sales person logs into the system, and is guided through a quick series of forms to enter specific information about the customer and product. Much of the information is prepopulated based on the sales person's login credentials. Once the sales person has chosen the customer, the product, and the quantity, specific business rules are applied to determine if the quotation can be automatically approved or if a manager or director needs to approve the quotation. Based on the required approvals, the form is routed to the appropriate management approver via an automated workflow.

5.3 Possible starting points for creating a form

The Workplace Forms Designer allows form designers to begin form creation in a number of ways:

- Designing a form from scratch
- Using a form template
- Using scanned paper forms
- Using Texcel FormBridge to convert an existing format
- Upgrading an earlier form

5.3.1 Designing a form from scratch

If the form you are creating has no paper counterpart or appropriate template, you need to start from scratch with a blank screen in the Designer. The layout tools provided rulers, guides, and alignment tools) help ensure that the items on your form are of a consistent size and line up correctly. One of the benefits of starting from scratch is that you can take full advantage of the different item types since you are not constrained by paper-based layout formats. Designing a form from scratch, however, takes a great deal of planning.

You should design a form from scratch if:

- The form requests company-specific information, but no paper counterpart exists.
- You decide to move away from a paper-based layout paradigm.
- Pre-existing applications use the form and it needs to fit a certain format.

Important: When you design a form from scratch, planning is essential. Forms can become large and complex, and if you do not have a firm plan to work from, you can easily find yourself facing a complete rearrangement near the end of the form design process.

Defining the purpose of the form

As you begin to plan, the first step is to consider the purpose of the form in detail. You may want to ask the following questions:

- What information will this form collect?
- In what order should users enter the information?
- Does the form need distinct sections? If so, how many?
- Should the form have more than one page? If so, what should go on each page?
- What security features are necessary?
- Should the form support digital signatures?
- To whom or to where will users submit the form?
- When the form is loaded, will items need to be updated by a database?
- Will any user input be submitted to a database?

Your answers to these questions dictate how the form looks and acts in the end, and should help you build a list of all of the items that you need to add to the form.

Determining your item type needs

Once you have a firm list of all of the information that your form needs to collect, you also need to think about how the form collects the information. Different types of information require different methods of collection. Your form can gather information in different ways by using different input items. Consider each piece of information displayed or collected by the form, and ask the following questions:

- What type of information will this item collect (numbers, text, “yes” or “no”, and so on)?
- Can I display necessary requests or instructions in the item?
- If any items ask the users to make a choice, should the form present the choices as mutually exclusive?
- If the form presents the choices as a list, should users have the option to type in other selections if none of the list choices fit (combo box)?

Make sure that you take other factors into account as you go, such as the need to reformat data, especially if the information gathered by the form is used by other applications.

5.3.2 Using a form template

You might want to use an existing sample form that fits your requirements regarding layout, wizard, or functionality to a certain degree as a basis for your forms project. Numerous industry-specific XFDL samples are shipped with the product and are available on the Web.

Tip: You have to be careful working with copy and paste of forms objects from other XFDL projects. All the properties and calculations are being copied as well, so that you might run into errors regarding references that are outside of your project. Be sure to make a syntax check of your form in the Workplace Forms Designer and check your source code for undesirable name references.

5.3.3 Using scanned paper forms

Form designers may use the Designer to create a form that already has a paper version but with no electronic version available. If this is the case, one way to reproduce the form with Designer is to use a template image. A template image consists of the scanned image of the paper form, saved in.bmp or .jpg format. This image is loaded into the Designer workspace, where the form designer can trace all of the elements of a paper form, reproducing the exact layout, look, and feel of the paper form.

If you need to convert a pre-existing paper-only form to an e-form, and you want to maintain the look and feel of the paper version, you may use the template image feature in the Designer. This feature allows you to load a scanned image of a paper form into the Designer and place items on top of their paper counterparts, thereby recreating the layout of the original.

Use a template image (scanned paper form) if:

- You need to duplicate the look and feel of a paper form.
- The form is very company specific.
- There is no sample form available, and you want to use the layout of a paper form as a reference.
- The form is not available in any electronic format, exists only as a paper copy, and the scanned paper form gives poor results when processed with optical character recognition (OCR) software.

This process essentially transforms a paper form into an e-form. Because e-forms use a different paradigm from paper, you can improve your transformation by following the tips provided here.

Before you start, you may want to think about the following questions:

- Do I want to use the same item types as the paper form? For instance, if a paper form has a section in which users are meant to check only one choice, you may want to use radio buttons rather than check boxes on the e-forms.
- Does the form require a toolbar? If the form requires the user to save, print, or submit, you may want to use a toolbar — a non-scrolling region at the top of a form that contains buttons or information that the user may want to use at any time. Toolbars save space because they are not printed and are not considered to be within the margins of the form.
- Do I want the form to specify user-input constraints for certain items and to provide help messages? These can save space also, since the *instructions* are hidden until the user tabs into the field or activates the help.
- Does the form require a signature for it to be considered completed? If so, include a signature button, allowing the user to digitally sign the form. Signing the form in this manner ensures that no changes are made in transit. You can create a signature button the same size as the signature space already provided on the form, but you may need to alter the instructions for signing slightly to prompt the user to click the signature button.

5.3.4 Using Texcel FormBridge to convert an existing format

FormBridge, from Texcel Systems, converts forms from PDF, Microsoft Word, and many other sources to Workplace Forms. The converted forms are fully editable in the Designer, just as if they were created by hand. FormBridge preserves the appearance of the original forms and is the fastest way to convert existing forms into Workplace Forms.

Use FormBridge to create your form if:

- You want to duplicate the look and feel of the original form.
- You want to reuse information from the original form to create wizard pages.
- The form is available as a file from a software application.
- The form is available only on paper and gives good results when processed with OCR software.

FormBridge features:

- Offer accurate and precise conversion of the original form layout.
- Automatically generate fields by analyzing the page layout when converting non-fillable forms.
- Convert existing fields and field properties (for example, name, data type, help text, and so on) from fillable PDF and other applications such as JetForm and FormFlow.
- Batch translations can be performed with a single operation.

Advantages of using FormBridge:

- Recreating a form by hand can take days. FormBridge reduces the time to create a form from days to hours.
- FormBridge eliminates the mistakes and reduces the proofing and cleanup associated with manual forms creation and scanning. It is a true digital conversion. No scanning is required when converting from an electronic file.

- FormBridge is easy to use and no specialized forms design experience is required. Conversion of existing form documents can help reduce manual form layout activities and speed time-to-deployment.
- It is much easier to work with a FormBridge generated form in the Workplace Forms Designer than to start from scratch, especially for a new user.
- Conversion from paper-only forms can be done with FormBridge by first scanning and processing with OCR software.

For more information about FormBridge and to download a FormBridge demonstration, go to:

`http://www.texcel.com/ibm/`

5.3.5 Upgrading an earlier form

You can use the Designer to create and edit forms. Forms created in the Designer are based on XFDL 7.0. To edit a form that is based on an earlier version of XFDL (for example, a form created in an older version of the Designer), you must upgrade the form to XFDL 7.0.

Restriction: You can only upgrade forms to IBM Workplace Forms Version 2.6.1 (XFDL 7.0) if the original form was written in XFDL 6.0 or later.

Some of the main improvements in Designer 2.6 are:

- The Designer interface is entirely new. Designer is now based on the Eclipse Platform, and the Designer interface is the Eclipse Workbench.
- The Designer now supports XFDL 7.0.
  - You can use Designer to upgrade forms from XFDL 6.x to XFDL 7.0.
  - The namespace URL for XFDL 7.0 is:

    `http://www.ibm.com/xmlns/prod/XFDL/7.0`
- The Designer now supports XForms 1.0.
- The Designer is now available in several different languages and locales.

Forms created on Workplace Forms Designer V2.6.1 are based on XFDL 7.0, and this is the version to which existing forms are upgraded.

5.4 Defining our XForms Model

We know that we are going to need to design a form that exchanges data with a DB2 database, and have also decided that utilizing the strengths of the XForms Model is the most effective way to accomplish this goal. The best way to approach our new form is to have the XForms instance data available before we begin our form layout. In this section we cover the following topics:

- The XForms Model
- XForms data instances
- XForms nodes
- Creating the instance

5.4.1 The XForms Model

The XForms Model is a block of XML data that contains three core parts that work together to create a complete model:

- Data instances — Data instances are arbitrary blocks of XML. A data model may contain any number of data instances, and each instance is normally created to serve a particular purpose. For detailed information about XForms data instances, see “XForms data instances”.
- Binds — The data layer and the presentation layer are connected by binds. For detailed information about XForms binding, see “Add XForms Model binds” on page 249.
- Submissions — Each data instance may have an associated set of submission rules. These rules control how a data instance is transmitted when it is submitted for processing. This is an optional feature, and is only necessary when you want to submit the data instance by itself, without the rest of the form. There are many cases in which you may want to submit the entire form, and then retrieve the data instance from the form during processing. This is particularly true when you are using signatures on your forms. For detailed information about signatures, see “Signature section of form” on page 275. For detailed information about XForms submissions, see “Form data access using XForms submissions” on page 390.

Note: We recommend that a form contain only one XForms Model, but multiple models are allowed (though they have no ability to interact with each other).

5.4.2 XForms data instances

An XForms data instance defines the XML template for the data that is collected from the form. A data instance can be used to store input values, pre-populate fields with data, or dynamically generate list selections.

An XForms Model can have more than one data instance. For example, one data instance can contain user information for a submission, while another data instance can contain user preference data. Additionally, you can link each data instance to a button on the form that triggers the submission of that instance.

It is a good idea to create each data instance, along with its associated binds and submission rules, by following these steps:

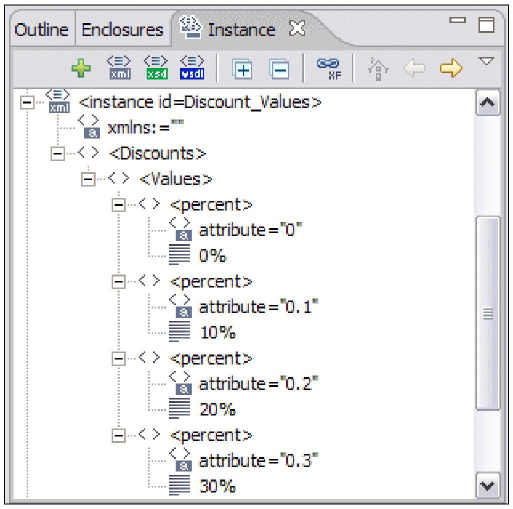
1. The first stage is to create a data instance. In this stage, you model your data instance by adding elements, attributes, and text values to the data instance.
2. The second stage is to bind the data instance to the form. This maps individual data elements to one or more user interface items so that they share data. For detailed information about binding see “Add XForms Model binds” on page 249.
3. Finally, you must define the submission rules for the instance if you intend to submit the data separately. These rules determine what data is selected and sets other submission-related properties. For detailed information about submissions see “Form data access using XForms submissions” on page 390.

5.4.3 XForms nodes

When working with XForms instances, it is important to know the terminology used to describe its elements. The data instance’s elements and attributes are collectively referred to as nodes. Since you have to bind the form’s user interface items to the various nodes in a data instance, it is important to understand node terminology.

Node terminology

The data instance shown in Figure 5-11 is used as an example to describe the various node types.



```
<instance id=Discount_Values>
  xmlns:=""
  <Discounts>
    <Values>
      <percent>
        attribute="0"
        0%
      <percent>
        attribute="0.1"
        10%
      <percent>
        attribute="0.2"
        20%
      <percent>
        attribute="0.3"
        30%
```

Figure 5-11 Instance view in the Designer

The node types are:

- Root node — The root node is the single node that contains all other nodes. You build your data instance by adding elements and attributes to the root node. A data instance can only have one root node. In the example, the root node is <Discounts>.
- Parent node — The parent node is an element that has other elements added to it. When a parent node contains more than one child element, it is also referred to as a node set. In the example, a parent node is <Values>.
- Child node — A child node is an element that is added to a parent element. In the example, <percent> is a child node of <Values>.
- Sibling node — When you add more than one child to a parent, each child node becomes a sibling node. You can add elements to a parent element as children or as siblings. In the example, a sibling node is <percent>.

  Note: Typically, you would only add a sibling element to the data instance if you forgot to add an element or the model has changed and needs to be updated.

- Attribute node — You can add attributes to an element. An attribute extends the functionality of an element and is typically used in the following circumstances:
  - You want to limit the size of data you are storing.
  - You have a group of items that you want to present to the user as a list of items.
  - You want to submit additional data related to the data entered by the user. For example, you could add an attribute to hold a product ID that the user never sees but that is submitted when the user selects the product.

  In the example shown in Figure 5-11, the attribute node is *attribute*.

Note: Node names cannot contain special characters (such as spaces, <, >, &, and so on).

Node text values

A node can also have a text value:

- Element text value — You can add a text value to a child element. Once you bind an element that has a text value to a user interface item, the text value is displayed to the user in the bound user interface item.

  In the example shown in Figure 5-11 on page 192, the element text values are "0%", "10%", "20%", and "30%".

  Note: Once you add a text value to an element, it can no longer be a parent node. In other words, you cannot add an element to an element that has a text value.

- Attribute text value — You can add a text value to an attribute. Once you bind an attribute that has a text value to a user interface item property, the text value is what will be stored in the referenced XForms instance element for the field as the item's value property.

  In the example shown in Figure 5-11 on page 192, the attribute text values are "0", "0.1", "0.2", and "0.3". If "10%" is chosen by a user from the discount list, "0.1" is submitted as the node value instead of "10%".

Note: In the pop-up field you will see the values of the item (for example, 10%) when you display the choices list to select a new entry. Having one entry selected, the form will display (and print) the selected text value (for example, 0.1).

5.4.4 Creating the instance

There are several different approaches to building our XForms Model instance data:

- Creating instances from WSDL messages
- Building XForms data instances through the Designer
- Defining your instance directly in the source panel

Creating instances from WSDL messages

Once you have added a WSDL file to your form, you can use its messages to create instances.

To create an instance from a WSDL message:

1. In the Instance view, click the **WSDL** button. This creates a new instance from a WSDL message.

   The WSDL Message window is displayed, listing the available WSDL messages from which you can create an instance.

   Note: If your form has more than one XForms Model, you must select the model that you want to add the new WSDL-based instance to.

2. Click the messages that you want to use to create an instance and then click **OK**. A separate instance is generated for each message you choose.

Building XForms data instances through the Designer

The Workplace Forms Designer allows the form author to define XForms Models and instances. Through the use of the Instance view, you can build a data instance by adding elements to it. You can further define your data instance by optionally adding attributes and text values to elements.

Adding child elements

To add a child element to the parent element:

1. In the Instance view, click the parent element.
2. Right-click and select **Add Element**. A new element is created beneath the parent element. If the parent already has children, then the new child is added after the existing children.
3. Double-click the new element, name it, and then Enter.

Adding sibling elements

Adding a sibling element inserts an element before an existing element. Typically, you would only add a sibling element to the data instance if you forgot to add an element or the model has changed and needs to be updated.

Note: Siblings can only be added before an existing child element.

To add a sibling element:

1. In the Instance view, click a child element.
2. Right-click and select **Insert Element Before**. A new sibling element is created above the selected child element.
3. Double-click the new element, name it, and press Enter.

Adding a text value to an element

You add a text value to an element when you want to display a value in a user interface item that is bound to the element. For example, if you want to inform a user that an input field is to be used for typing their last name, you could add a text value of `Type your last name here` to the <last_name> element. Once the <last_name> element is bound to the input field, the text value appears in the field.

To add a text value to an element:

1. In the Instance view, right-click the element that you want to add a text value to.
2. Click **Add Text**.
3. Double-click **text**, type the text value, and then press Enter.

Note: After you bind the element to an XForms user interface item, the text value appears in the bound user interface item.

Adding attributes to an element

An attribute extends the functionality of an element. Essentially, an attribute is another tool you can use to model your instance. You can add one or more attributes to an element. If an element has more than one attribute, each attribute must have a unique name. For example, you could add three child elements to a <name> parent element: <first>, <middle>, and <last>. Alternatively, you could add three attributes to a <name> element: first, middle, and last.

To add an attribute to an element:

1. In the Instance view, right-click the element that you want to add an attribute to.
2. Click **Add Attribute**. An attribute is added immediately beneath the element.

3. Double-click the newly added attribute, type a descriptive name for the attribute, and press Enter.
4. To add additional attributes, repeat steps 1 through 3.

Adding a value to an attribute

When you add a value to an attribute it creates an optional piece of data that is associated with the node. This value can then be submitted. This is helpful when you want to store a truncated value coming from the user interface or to submit information that is associated with the user-selected data such as an internal product code.

To add a text value to an attribute:

1. In the Instance view, right-click the attribute that you want to add a text value to and click **Edit**.
2. Type the text value and then press Enter.

When you bind the element to an XForms user interface control, the attribute's value is what is stored as the element value when a user chooses a value.

XPath and nodes

XPath referencing lets you bind the node or node set with XForms items in the form or with model item properties that calculate values or place limitations on the nodes.

Defining your instance directly in the source panel

It is also possible to define your XForms Model instances manually, or to paste XML fragments that define instance data directly into the source panel. All XForms instances must be prefixed with the xforms tag, as shown in Example 5-1.

Example 5-1 XForms instance declaration

```
<!-- Discount values between 10 and 30 percent - select percentage, display float
integer -->
   <xforms:instance id="Discount_Values" xmlns="">
      <Discounts>
         <Values>
            <percent attribute="0">0%</percent>
            <percent attribute="0.1">10%</percent>
            <percent attribute="0.2">20%</percent>
            <percent attribute="0.3">30%</percent>
         </Values>
      </Discounts>
   </xforms:instance>
```

The Discount_Values instance referenced earlier is shown here. When defining an instance like this you must pay close attention to syntax. Fortunately, the Source editor included with the Designer is capable of predictive scripting, which is very helpful when working directly with the code.

Note: When you create an XML Model data instance, the instance is prefixed by `xforms`. For example:

```
xforms:instance ID =instance1
```

It is important to note that this prefix standard was added to XML Model instances while W3C XForms was in development. It is not the official W3C XForms 1.0 standard.

5.5 Create the stage1 form

Throughout these next sections we discuss how to create the initial forms and establish the key design and layout of the forms. We approach the issue in terms of what needs to be done — first, for the traditional form pages, and second, for the subsequent wizard pages.

In our sales quote approval sample we use a scanned image as a template for the traditional form page. We then add the items to the page and usually remove the template when we are done designing the traditional form.

Attention: To assist you in building this sample application, we provide the image we use for the scanned form. The file Form_Page_scanned_image.jpg can be downloaded from the Additional Materials with the book. See Appendix D, “Additional material” on page 693, for detailed information about how to download the file.

The wizard pages are then designed from scratch starting at a blank page. First, we define the layout of the form before we add the items. You may want to sketch the layout on paper before you start building it in the Designer.

In this section we cover the following topics:

- Create a new form with XForms support.
- Add XForms Model instance data.
- Create the form template.
- Create a Resource page.

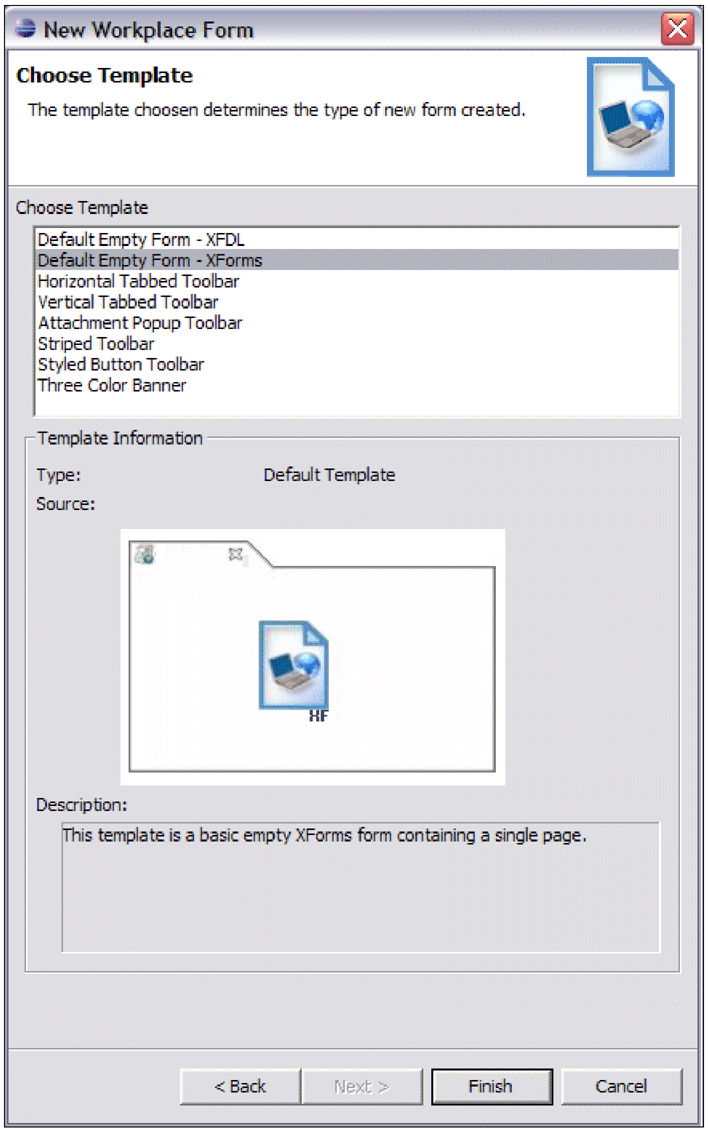
5.5.1 Create a new form with XForms support

The new form includes support for XForms Models. To create the new form follow the steps outlined below.

1. In the Designer, click **File** → **New** → **New Workplace Forms**, which starts a wizard to create the new form. Enter or select the parent folder for the new form, enter the file name of the new form, and click **Next** to select the template.

   Note: File → New → New Workplace Form is only available in the Designer perspective. To create a form in any perspective, select **File** → **New** → **Other** and select the **Workplace Forms** → **New Workplace Form** wizard.

2. In our example choose **Default Empty Form - XForms** from the template list and click **Finish**, as shown in Figure 5-12.


New Workplace Form

Choose Template

The template choosen determines the type of new form created.

Choose Template

Default Empty Form - XFDL
Default Empty Form - XForms
Horizontal Tabbed Toolbar
Vertical Tabbed Toolbar
Attachment Popup Toolbar
Striped Toolbar
Styled Button Toolbar
Three Color Banner

Template Information

Type: Default Template

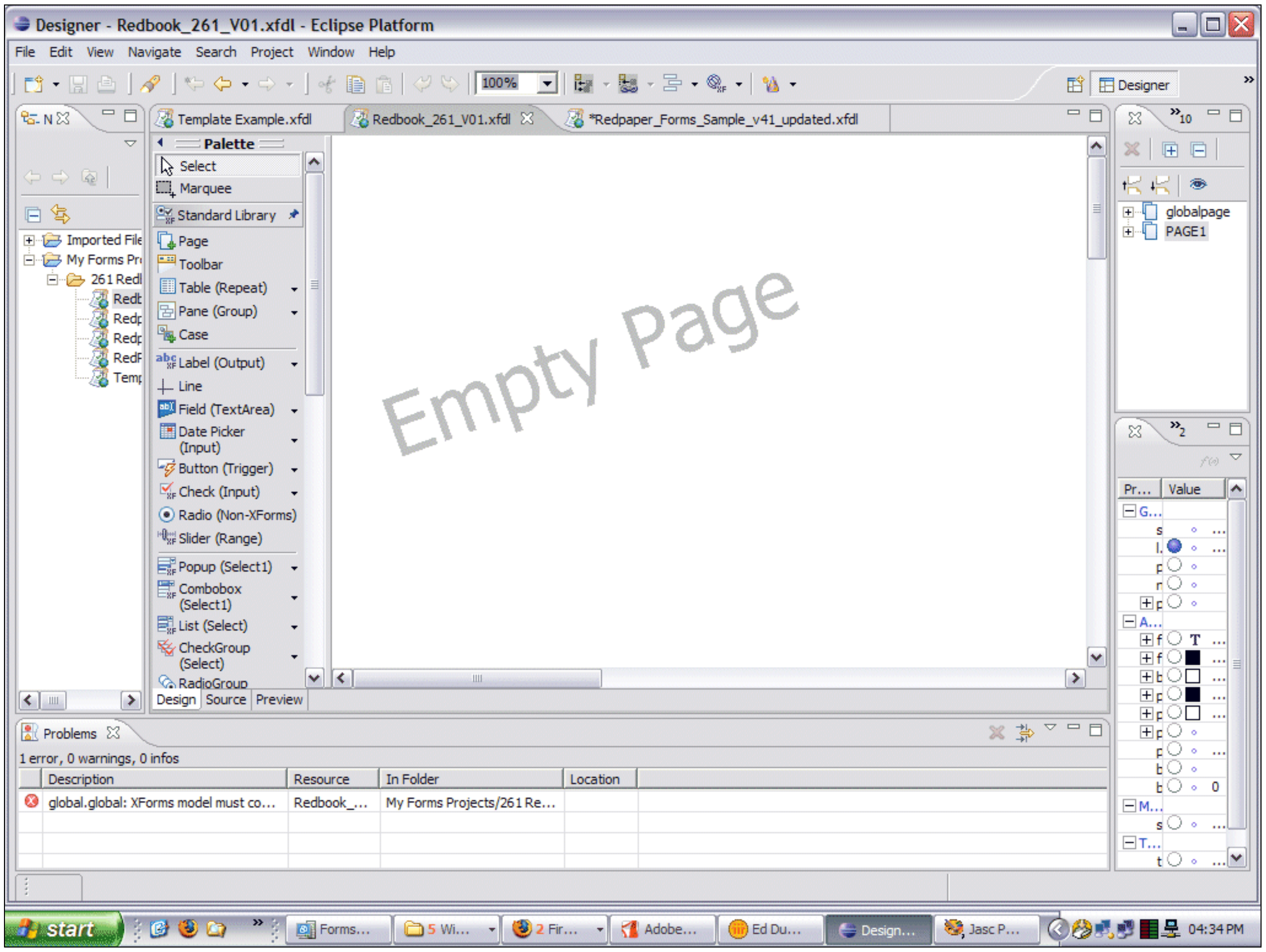
Source:

Description:

This template is a basic empty XForms form containing a single page.

Figure 5-12 New Workplace Form wizard

3. The form loads in the Design Perspective, as shown in Figure 5-13.



1 error, 0 warnings, 0 infos

Description	Resource	In Folder	Location
global.global: XForms model must co...	Redbook_...	My Forms Projects/261 Re...	

Figure 5-13 Empty XForms page in the Design perspective

One of the very first things to consider is the creation of a project folder for the new form. A project folder is the designated file location where all of the form revisions, externally associated file resources, schemas, and just about anything may be stored. To create a new project folder go to the Navigator view in the Designer. Right-click the **My Forms Projects** folder. In the pop-up select **New** → **New Folder**. Provide a name, select a location, and save your new folder. We use 261Redbook as the file name and save the folder to the default location of our workspace, but the location could just as easily be a network file share (see Figure 5-14).

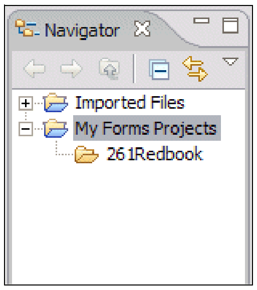
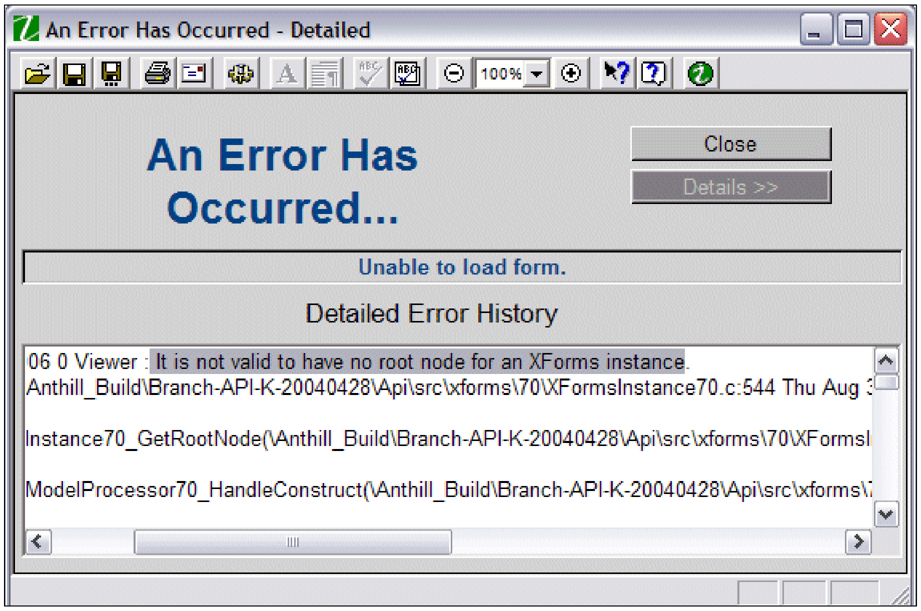


Figure 5-14 New project folder

To create the new form right-click the **261Redbook** folder and select **New** → **New Workplace Forms**.

We now have a canvas, a project folder, and all of the necessary XForms and XFDL items necessary to design our form, with one exception. We do not have an XForms Model root instance defined. If we attempt to preview this form without a XForms Model, an error is generated, as shown in Figure 5-15.



```
06 0 Viewer : It is not valid to have no root node for an XForms instance.
Anthill_Build\Branch-API-K-20040428\Api\src\xforms\70\XFormsInstance70.c:544 Thu Aug 3

Instance70_GetRootNode(\Anthill_Build\Branch-API-K-20040428\Api\src\xforms\70\XFormsI

ModelProcessor70_HandleConstruct(\Anthill_Build\Branch-API-K-20040428\Api\src\xforms\7
```

Figure 5-15 XForms instance error

The only way to resolve this error is to create a root node for the XForms instance. Since it is absolutely essential to be able to preview the form design as it is created, this issue needs to be resolved.

5.5.2 Add XForms Model instance data

We create multiple XForms instances based on the logical breakdown of the form and our backend system integration needs even though we do not integrate to any backend systems in stage 1. We include the newly defined instances in the form using the steps defined below.

XForms Model instances

The XForms Model has several instances that serve different purposes. It is provided to us from our backend system administrator in the form of a flat XML file that contains XML fragments. There are 12 instances in our model, as shown in Example 5-2 on page 200.

- BusinessRuleParameters provides upper and lower thresholds for signature requirements.
- CustomerIDs - results of backend system query to form a dynamic list of customers IDs based on the information stored there.
- PositionList is a static list of employee roles used to populate list.
- InventoryItems - results of backend system query to form a dynamic list of inventory item names based on the information stored there.
- SelectionInfo - results of backend system query to form a dynamic list of inventory item IDs and customer IDs based on the information stored there.

- CustomerDetails will store or show customer details of a backend system query based on customer ID selection.
- EmployeeDetails will store or show results for employee details.
- Discount_Values is a static list of available discounts from zero to thirty percent (0–30%).
- InventoryItemDetails shows the detailed results of a backend system query based on selected inventory item ID.
- OrderTableRowData used to represent the dynamic table needed to create our form.
- FormMetaData is used to update and maintain form values necessary to process business rules.
- FormOrderData captures all salient information captured and calculated in the form for backend system submission.

Example 5-2 XForms Model instances

```
<!-- Form Configuration Parameters -->
<!-- Business Rule Parameters -->

<xforms:instance id="BusinessRuleParameters" xmlns="">
   <BusinessRuleParameters>
      <BusinessRuleParams>
      <QuoteLevelOneThreshold>10000</QuoteLevelOneThreshold>
      <QuoteLevelTwoThreshold>50000</QuoteLevelTwoThreshold>
      </BusinessRuleParams>
   </BusinessRuleParameters>
</xforms:instance>

<!--*************************************************************************-->
<!--************************ PRE-POPULATED INSTANCES *************************-->
<!--*************************************************************************-->

<!-- this instance provides the choices list for the customers -->

<!-- Customer and Item Selection Info-->
<xforms:instance id="" xmlns="">
   <>
      <InventoryItemID></InventoryItemID>
      <CustomerID></CustomerID>
   </>
</xforms:instance>

<!-- this is an instance for the choices list associated with employment positions
on Page1 -->

<xforms:instance id="PositionList" xmlns="">
   <Positions>
      <Position></Position>
   </Positions>
</xforms:instance>

<!-- this instance provides the choices list for the items -->

<xforms:instance id="InventoryItems" xmlns="">
   <InventoryItems>
```

```
      <InventoryItem></InventoryItem>
   </InventoryItems>
</xforms:instance>

<!--**********************************************************************-->
<!--************* User / Runtime Populated Instances ************************-->
<!--**********************************************************************-->

<!-- Customer and Item Selection Info-->

<xforms:instance id="SelectionInfo" xmlns="">
   <SelectionInfo>
      <InventoryItemID></InventoryItemID>
      <CustomerID></CustomerID>
   </SelectionInfo>
</xforms:instance>

<!-- Detail data for the Selected Customer -->

<xforms:instance id="CustomerDetails" xmlns="">
   <CustomerDetails>
      <Customer>
         <ID></ID>
         <Name></Name>
         <AccountManagerID></AccountManagerID>
         <Department></Department>
         <ContactName></ContactName>
         <ContactPosition></ContactPosition>
         <ContactEmail></ContactEmail>
         <ContactPhone></ContactPhone>
         <CRMNumber></CRMNumber>
      </Customer>
   </CustomerDetails>
</xforms:instance>

<!-- Detail Data for the Indicated Employee (previously FormOrgData)-->

<xforms:instance id="EmployeeDetails" xmlns="">
   <EmployeeDetails>
      <Employee>
         <FirstName></FirstName>
         <LastName></LastName>
         <ID></ID>
         <ContactInfo></ContactInfo>
         <Manager></Manager>
      </Employee>
   </EmployeeDetails>
</xforms:instance>

<!-- Discount values between 10 and 30 percent - select percentage, display float
number -->

<xforms:instance id="Discount_Values" xmlns="">
   <Discounts>
      <Values>
```

```
         <percent attribute="0">0%</percent>
         <percent attribute="0.1">10%</percent>
         <percent attribute="0.2">20%</percent>
         <percent attribute="0.3">30%</percent>
      </Values>
   </Discounts>
</xforms:instance>

<!-- Detail data for the Selected Inventory item -->

<xforms:instance id="InventoryItemDetails" xmlns="">
   <InventoryItemDetails>
      <Item>
       <ID></ID>
       <Name></Name>
       <Price></Price>
       <NumberInStock></NumberInStock>
      </Item>
   </InventoryItemDetails>
</xforms:instance>

<!-- Row Data for the Selected Item -->

<xforms:instance id="OrderTableRowData" xmlns="">
   <OrderTableRowData>
      <Row>
         <line>
            <id></id>
            <name></name>
            <price></price>
            <stock></stock>
            <amount></amount>
            <discount></discount>
            <line_total></line_total>
            <subtotal></subtotal>
         </line>
      </Row>
   </OrderTableRowData>
</xforms:instance>

<!-- Form Meta Data.  Some values set at design-time and others are set at
runtime.  See comments. -->

<xforms:instance id="FormMetaData" xmlns="">
   <FormMetaData>
      <FileName></FileName> <!-- Calculated on first submit -->
      <Version>0</Version> <!-- Populated at design time -->
      <CreationDate></CreationDate> <!-- Populated at time of request -->
      <CompletionDate></CompletionDate><!-- Populated upon final submission -->
      <State>1</State> <!-- changes based on form status -->
      <PreviousState>0</PreviousState> <!-- changes based on form status) -->
      <Owner></Owner> <!-- changes based on form status) -->
   </FormMetaData>
</xforms:instance>
```

```
<!-- Order Data.  Information about this specific order including approvals and
timestamps.-->

<xforms:instance id="FormOrderData" xmlns="">
   <FormOrderData>
      <ID>10101010</ID>
      <CustomerID></CustomerID>
      <Amount>0</Amount>
      <Discount>0</Discount>
      <SubmitterID></SubmitterID>
      <State>1</State>
      <CreationDate></CreationDate>
      <CompletionDate></CompletionDate>
      <Owner></Owner>
      <Version>0</Version>
      <Approver1></Approver1>
      <AppovalDate1></AppovalDate1>
      <Approver1Comment></Approver1Comment>
      <Approver2></Approver2>
      <AppovalDate2></AppovalDate2>
      <Approver2Comment></Approver2Comment>
      <Cost></Cost>
      <StateDisp></StateDisp>
      <OriginatorRole></OriginatorRole>
   </FormOrderData>
</xforms:instance>
```

After reviewing the instance declarations for errors, the file is imported into our 261Redbook project folder, as shown in Figure 5-16, so that we can access it easily in the Designer and keep all of the project source files together. This is an optional step.

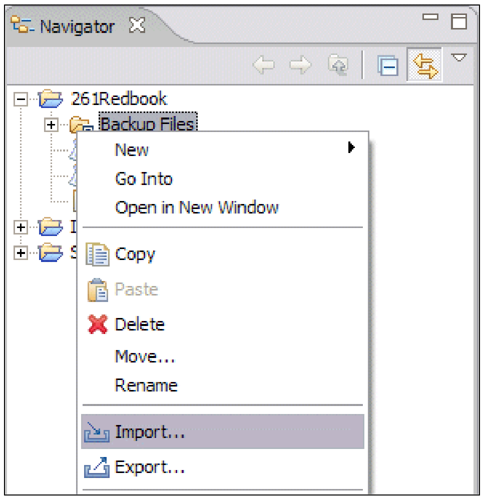


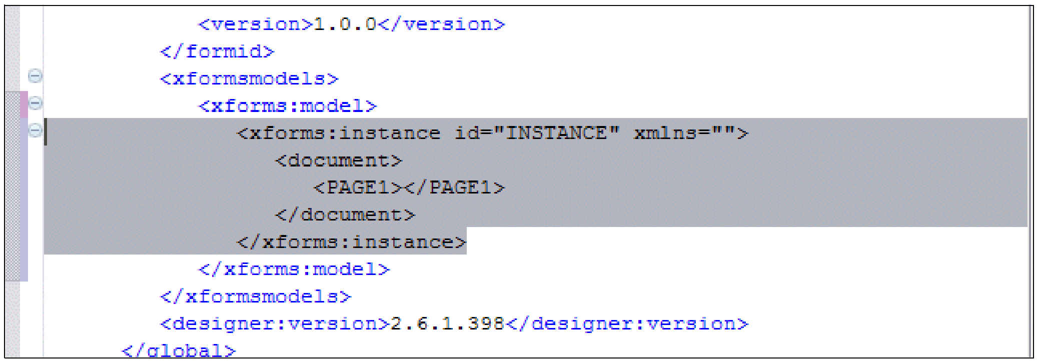
Figure 5-16   Import XML file

We can open this file in the Designer by double-clicking it from the Navigator view. This allows us to make changes if necessary, and to copy our instances from the flat file to the form. Double-click **Now** to open the file. Select all of the instances (Ctrl+A) and copy them (Ctrl+C).

Add an instance to the form

To do this:

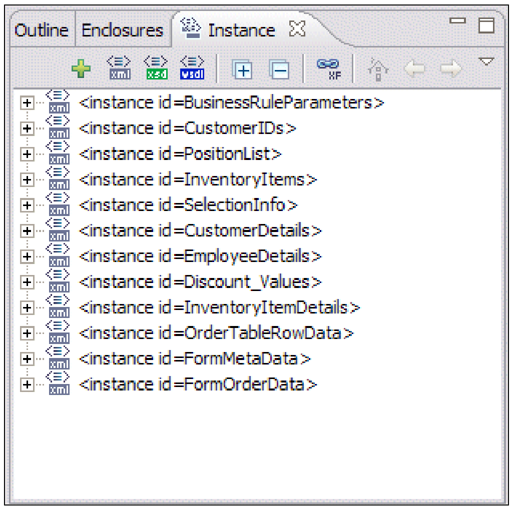
1. Return to the sales quote form.
2. In the Designer, go to the Instance view.
3. Click the plus sign icon to add an instance.
4. Paste the new instances copied earlier directly into the source of the sales quote form.
5. Click the **Source** tab in the Designer for the sales quote form.
6. Locate the XForms Model declaration.
7. Highlight the default instance just created, as shown in Figure 5-17.



```
            <version>1.0.0</version>
         </formid>
         <xformsmodels>
            <xforms:model>
               <xforms:instance id="INSTANCE" xmlns="">
                  <document>
                     <PAGE1></PAGE1>
                  </document>
               </xforms:instance>
            </xforms:model>
         </xformsmodels>
         <designer:version>2.6.1.398</designer:version>
      </global>
```

Figure 5-17 Highlight default instance

8. Paste the new instances by pressing Ctrl+V while the default instance is still highlighted. All of the new instances are pasted into the source code and are now ready for us to use.
9. Save your changes. There should not be any errors, but if there are, you are immediately notified.
10. Return to the Design perspective and go to the Instance view to validate the successful changes. When finished all of the instances should be shown as in Figure 5-18.



```
<instance id=BusinessRuleParameters>
<instance id=CustomerIDs>
<instance id=PositionList>
<instance id=InventoryItems>
<instance id=SelectionInfo>
<instance id=CustomerDetails>
<instance id=EmployeeDetails>
<instance id=Discount_Values>
<instance id=InventoryItemDetails>
<instance id=OrderTableRowData>
<instance id=FormMetaData>
<instance id=FormOrderData>
```

Figure 5-18 Instance results

Now that we have all of the instances necessary for us to begin designing our form we can proceed. The following sections discuss the first step in building your forms — namely, beginning with the correct layout.

5.5.3 Create the form template

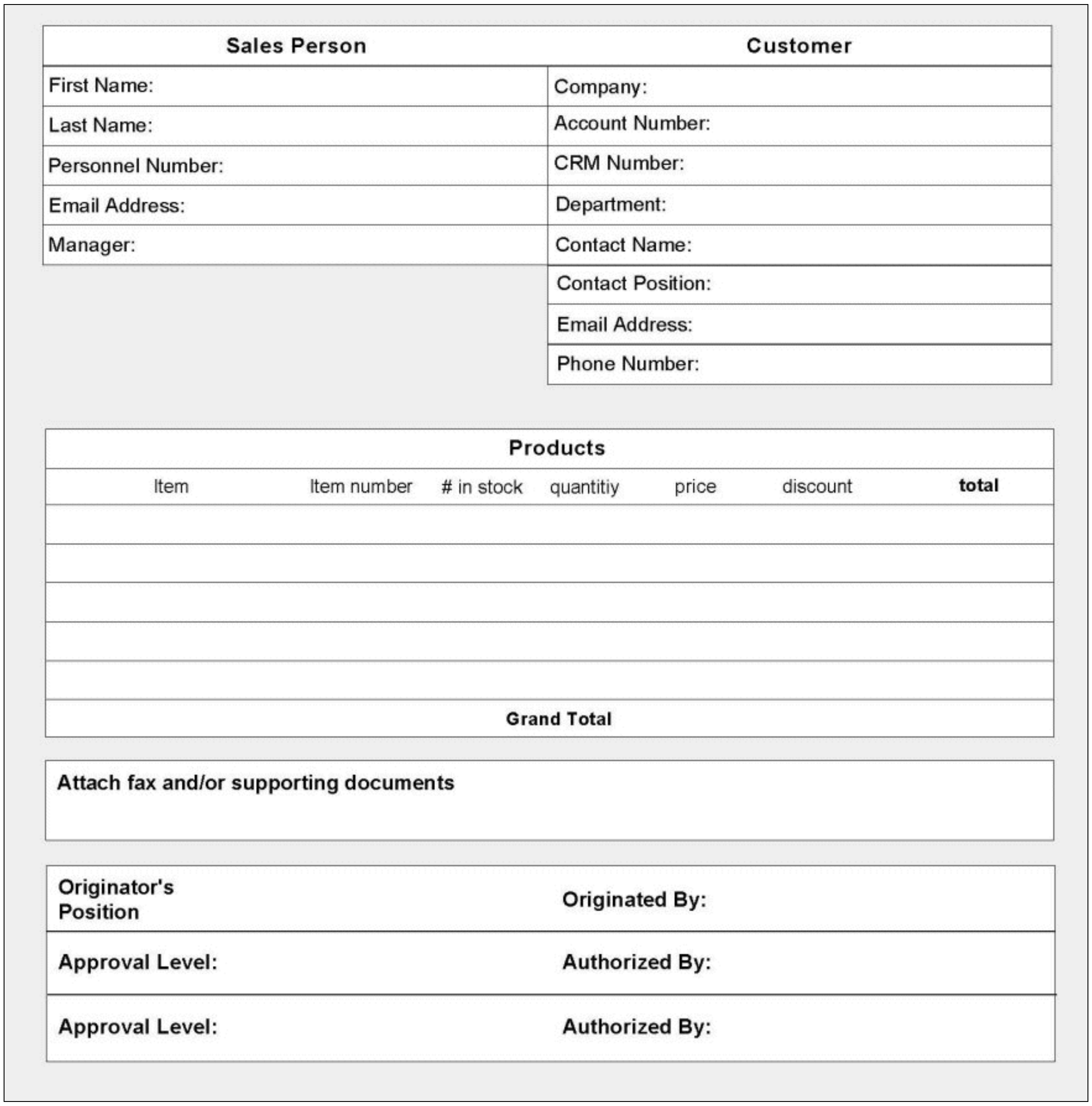
The Designer's workspace has a number of features that make it easy to create professional-looking forms quickly. In this section we examine a few of them and explore the workspace.

On page 1 we create an e-form representation of the original form by first utilizing a scanned image of the form as a template for the layout of our items to reproduce a near pixel perfect copy. On this page we add functional sections to manage attachments, and capture multiple overlapping signatures. Next we create a resources page to store shared graphics and cells. We then add a toolbar to page 1 with navigational elements to allow the end user to move to other pages. Once everything is properly laid out and functional, we reuse many of these elements to create the wizard pages. The topics covered in this section include:

- Building the traditional form page
- Add scanned image to form page
- Add layout items to the template page
- Enhancing the form
- Reviewing the layout for the traditional form page

Building the traditional form page

For the traditional form page, you should use a preset page size of the paper format like letter or A4 since this page will typically be used for printing the form. Figure 5-19 shows the scanned image that we created to use as a template for the page.



Sales Person	Customer
First Name:	Company:
Last Name:	Account Number:
Personnel Number:	CRM Number:
Email Address:	Department:
Manager:	Contact Name:
	Contact Position:
	Email Address:
	Phone Number:

Products						
Item	Item number	# in stock	quantitiy	price	discount	**total**
Grand Total						

Attach fax and/or supporting documents

Originator's Position	**Originated By:**
Approval Level:	**Authorized By:**
Approval Level:	**Authorized By:**

Figure 5-19 Scanned image to be used as a template for the traditional form page

Add scanned image to form page

To build our form from scratch, we start with the traditional form, and create a near pixel perfect representation of the original form. To do this we apply the scanned image of our form as a background image for the first page of the form document.

To create a scanned template for the traditional form page, follow these steps:

1. Scan your paper form and save it in a compatible format (.bmp, .jpg, .ras, .png). It is important that the scanned image be scaled to fit the Designer form area (945x1220 pixels in our case).

2. In the Outline view, expand the page that you want to add a background image to and select **Page Global**, as shown in Figure 5-20.

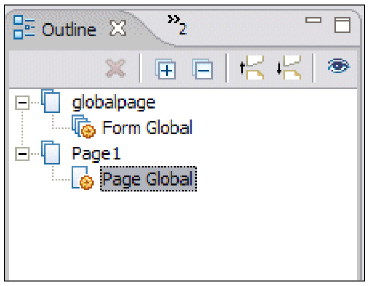
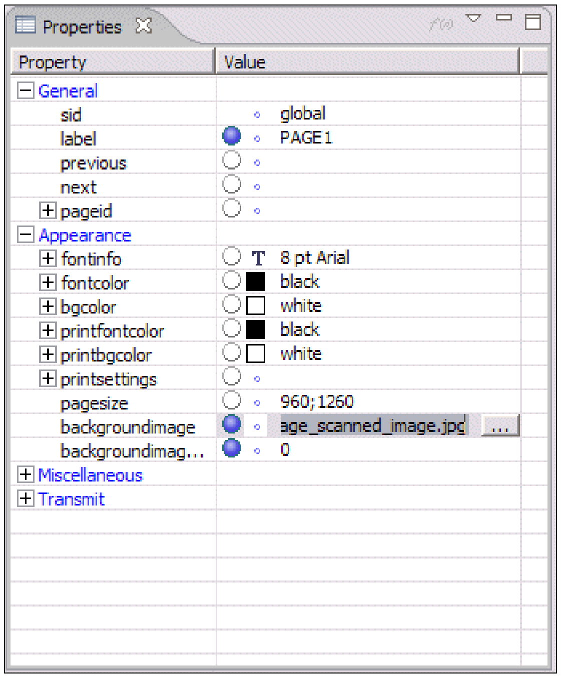


Figure 5-20 Page Global in the Outline view

3. In the Properties view, expand **Appearance**.
4. Click within the backgroundimage value field. Type the path and file name for the image (for example, c:\myfile\scanned form.jpg), as shown in Figure 5-21. Press Enter when finished.
5. Click within the backgroundimagealpha value field. Type a value between 0 and 255 to set the transparency of the background image. Zero represents the lightest (invisible) image background, and 255 the darkest.



Properties

Property	Value
General	
sid	global
label	PAGE1
previous	
next	
pageid	
Appearance	
fontinfo	8 pt Arial
fontcolor	■ black
bgcolor	□ white
printfontcolor	■ black
printbgcolor	□ white
printsettings	
pagesize	960;1260
backgroundimage	age_scanned_image.jpg ...
backgroundimag...	0
Miscellaneous	
Transmit	

Figure 5-21 Properties view of page with template form image

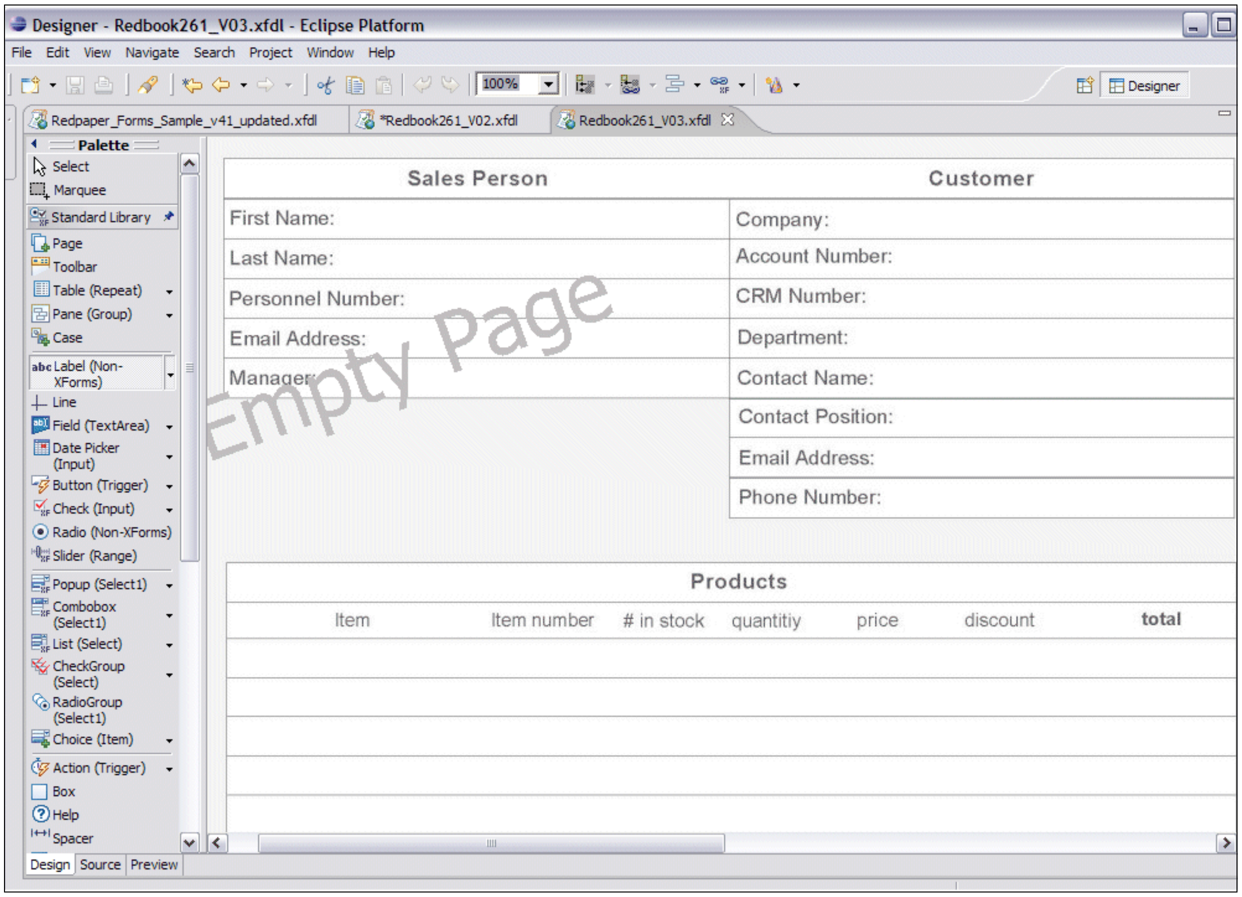
Tip: If the template is too obtrusive in the Designer, adjust the value of the backgroundimagealpha property to a lower number in the Properties view to a setting that is comfortable. For our design environment it is set to 50.

6. Optional: It may be useful to give the first page of the form a specific name (default value is “Page 1”) by entering it in the *label* property. Using the original paper form name makes the form more recognizable in its new e-form format.

7. If desired, you may also change the background color of your form by updating the value of the bgcolor property under the Appearance category in the Properties view. This background color is not visible until you preview the form or remove the template image. You can also set the font to the most commonly used font on the form.

> **Tip:** It is a good idea to decide on the page name, background color, default font, and page size before you begin. While you can change the page properties at any time, setting them after there are items already on the form can cause problems with sizing, appearance, and, if the page name is changed, references from other pages.

In Figure 5-22 you can see the see the scanned image as a background template on a traditional page in Workplace Forms Designer. The template now serves as a pattern to precisely position our layout item and imitate the original paper form. The background image is only visible in the Designer. It is not visible in the Viewer and will not print. The form page also has a watermark titled Empty Page that disappears when you add an item to the page. After you have added the layout items to the form page, you should remove the image by clicking the property state indicator to set the value of the backgroundimage property (on the Properties view) to blank. Alternatively, you could set the backgroundimagealpha property to zero (0).



Sales Person	Customer
First Name:	Company:
Last Name:	Account Number:
Personnel Number:	CRM Number:
Email Address:	Department:
Manager:	Contact Name:
	Contact Position:
	Email Address:
	Phone Number:

Products

Item	Item number	# in stock	quantitiy	price	discount	total

Figure 5-22 Traditional form page with scanned image template inserted

5.5.4 Create a Resource page

A *Resource* page can be used to store reusable items that may be referenced on multiple pages in the form. In our form we include such things as the Redbooks and IBM Logo, which is referenced on all of our pages in this form document. This page is never displayed in the Viewer — its sole purpose is to act as a container of sorts for items used by the other pages in this form document. By doing so, it decreases the system resources needed to render our form.

Add page

To add the page, select a page item from the Designer's palette and then click **Page1** in the Outline view, as shown in Figure 5-23.

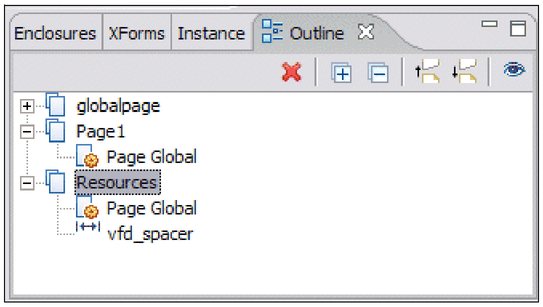


Figure 5-23 Create Resources page

Enclose graphics

Next we attach our graphic files as enclosures in the form. To enclose a file, switch to the Enclosures view. If this view or any other view is not currently available, you can add a view to your Designer perspective by selecting **Window** → **Show View** → **Enclosures,** as shown in Figure 5-24.

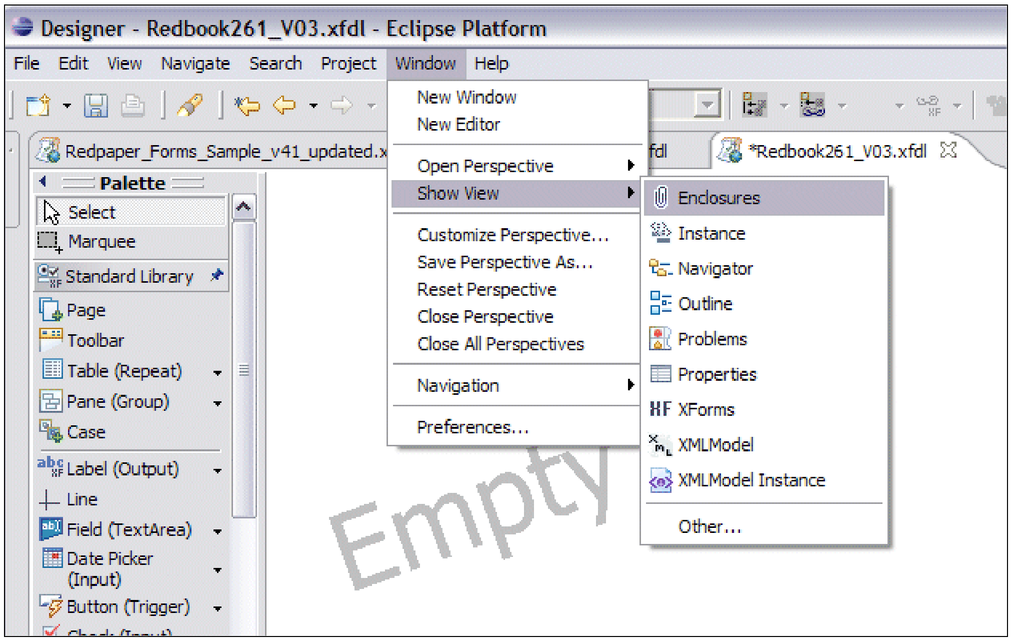


Figure 5-24 Show view

Once in the Enclosure view, expand the **Data** group, go to the Resources page, and right-click that entry. Select **Enclose File** from the resulting pop-up window, as shown in Figure 5-25.

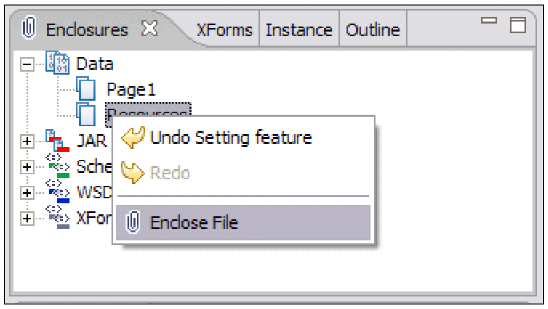


Figure 5-25 Enclose file

Using the Choose File dialog that launches, you can browse to your graphic file location and select it, as shown in Figure 5-26. In this case we select a local Redbooks logo.

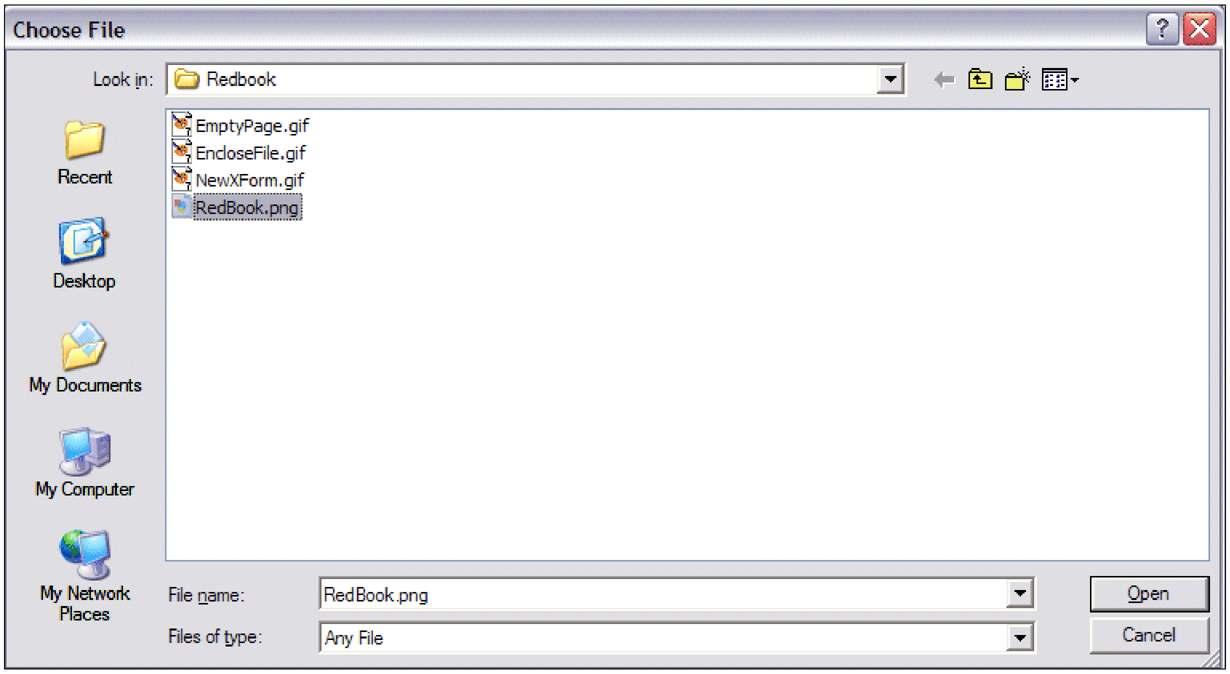


Figure 5-26 Choose File dialog

We then repeat the previous steps to add a second image, the IBM Workplace Forms graphic. The resulting enclosures are shown in Figure 5-27.

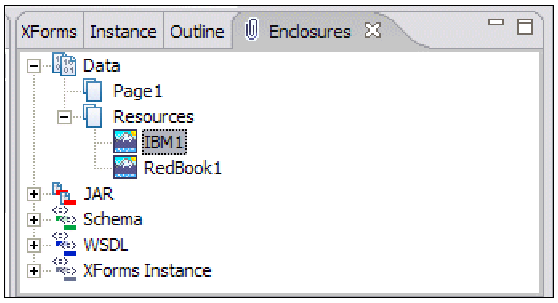


Figure 5-27 Two enclosures

These two graphics can now be referenced throughout the form by other items such as cells used for drop-down lists, and combo boxes. As we continue to develop this form, we may return to the resources page to add additional items.

5.6 Add layout items to the template page

There are several approaches that can be taken when creating layout items. The approach selected depends on a number of different factors. Two methods are:

- The first method we demonstrate is the most basic where we recreate the original form by adding the appropriate items to the form. We use alignment tools to place lines, boxes, labels, and fields onto the form. This can be more labor intensive due to the number of items that have to be created and the need to create the appropriate binds to the XForms Model, but is necessary in some cases. We refer to this as the *basic method*.
- The second approach we demonstrate is more advanced and takes advantage of the XForms Model instance definitions that we created earlier. It greatly accelerates design time, provided that the appropriate data instances have been properly defined first. We refer to this as the *XForms Model method*.

To build the layout of the form we cover the following topics:

- Basic method.
- Define references (XPath).
- XForms Model method.
- Create dynamic XForms table.
- Add advanced items to table.
- Add XForms Model binds.
- File attachment section.
- Signature section of form.

5.6.1 Basic method

This is the most basic approach and requires a bit more work. It is necessary to take this approach if an XForms Model is not needed for a simpler form, or if the XForms Model is not available in advance, which is occasionally true.

In this section we cover the following topics:

- Create sales person.
- Place lines and boxes.
- Place labels and fields.

Create sales person

We illustrate this method by recreating the sales person data section of the original form manually. We then show how it can be bound, or linked, to an XForms Model once the layout is completed.

Rulers, guides, and layout grids

When designing any form it is useful to take advantage of the ruler and grid tools available in the Designer. Rulers and guides help you to measure the size and position of items on the form. Rulers and guides are useful for creating a clean, symmetrical layout for your form. The layout grid is an evenly spaced grid of horizontal and vertical lines that is superimposed on the form.

- *Rulers* enable you to measure items in inches or pixels. (Rulers appear automatically on the top and left borders of the form when you create a new form.) To show or hide rulers, click **View** → **Show Rulers**. Once set on, rulers are displayed in each working session.
- *Guides* are thin red lines that you can place directly on the form to help you align items manually. They appear in the Designer, but are not visible when the form is opened in the Viewer. You set up guides to assist in aligning items precisely.
  - To create a guide:
    i. Click **View** → **Show Rulers**.
    ii. Click the ruler and drag the guide to the desired position.

  Note: Guides are not saved after closing the file.

- *Layout Grids* help you line up items on the form and ensure uniform spacing. To show or hide the grid, click **View** → **Show Grid**. Once turned on, grids are displayed in each working session unless turned off at a later point.

Let us turn on the rules and grids first. Using the steps above, turn on the rulers and layout grids. Now let us add guide lines to our form canvas to highlight the edges of the sales person data section:

1. Click the horizontal ruler on the top of our form design canvas and drag the guide to the left-most vertical line of the sales person section of the form.
2. Repeat the process to add a second guide to the horizontal ruler. Align it to the right-most side of the sales person section of the form.
3. Add a guide line to the vertical ruler, aligning it with the top-most line of the sales person section.

Repeat the process to add a second guide to the vertical ruler. Align it to the bottom of the sales person data section.

Tip: When you place or expand an item on the form directly in-line with the grid lines, the grid lines will turn red. If your text is misaligned then they will remain the default color.

When finished it should look like the image shown in Figure 5-28.

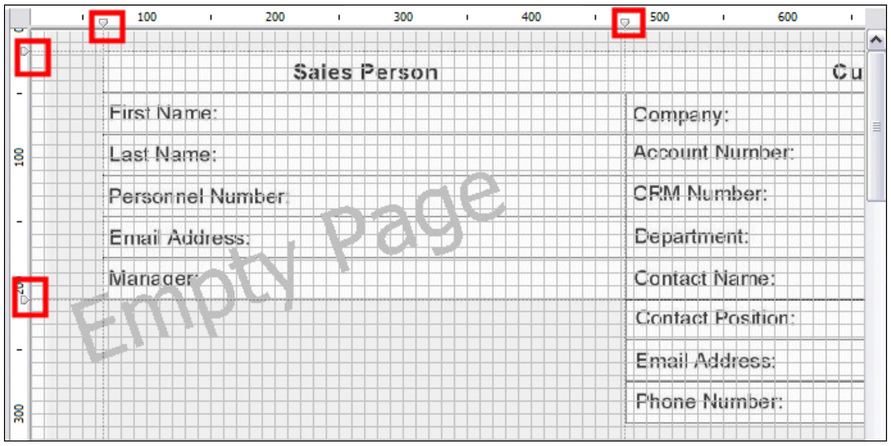


Figure 5-28 Guide lines

Place lines and boxes

We begin by placing all of the necessary lines and boxes on our form for the Sales person section, providing us with the layout needed for our labels and fields.

Boxes

First, we add a box on to the form. We start with a box because it functions as a container for our lines, labels, and fields. Another benefit of using a box here is that it saves us some time by eliminating the need to create vertical lines for the border, and reducing the number of horizontal lines needed by two. (The box provides us with a top and bottom line.)

Add a box item to the form. Be sure to align it properly on the grid lines added earlier, as shown in Figure 5-29.

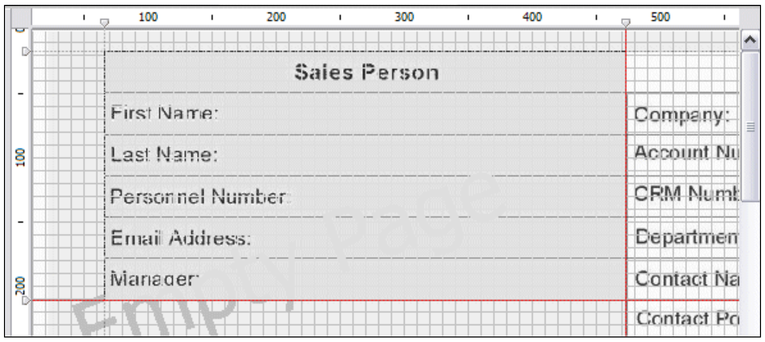
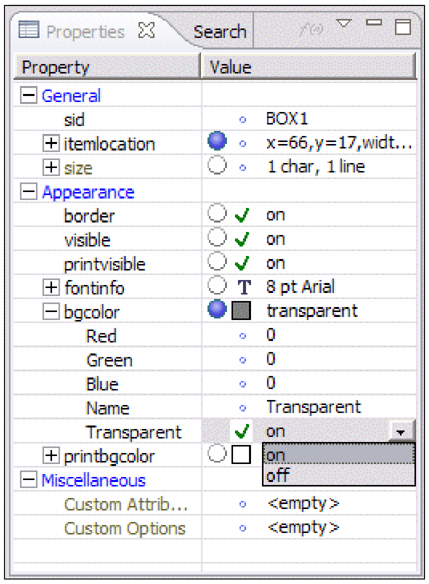


Figure 5-29 Add box to the form

If you look back to the original form, notice that the sections of this form are differentiated by the background color (white). Using a box allows us to reproduce it if we like. However, to demonstrate a key property of box items we have decided not to use a background color. Instead, we turn on the transparent property for the box. To do this go to the Properties view of our new box and set the bgcolor → transparent to on, as shown in Figure 5-30.



Property	Value
General	
sid	BOX1
itemlocation	x=66,y=17,widt...
size	1 char, 1 line
Appearance	
border	✓ on
visible	✓ on
printvisible	✓ on
fontinfo	8 pt Arial
bgcolor	transparent
Red	0
Green	0
Blue	0
Name	Transparent
Transparent	✓ on
printbgcolor	on / off
Miscellaneous	
Custom Attrib...	<empty>
Custom Options	<empty>

Figure 5-30 Turn on transparency

Tip: When adding items to a form that uses an image for your template it is easier to align items on the form if a transparent background is used. Otherwise, items such as boxes can obscure the layout items of the template.

Lines

Start at the top of the sales person section and place a horizontal line on the form. Do not be concerned about size or left/right alignment at this point. Position the line item on the template line just above First Name. Now use absolute expand to make it the same width as the box, as shown in Figure 5-31.

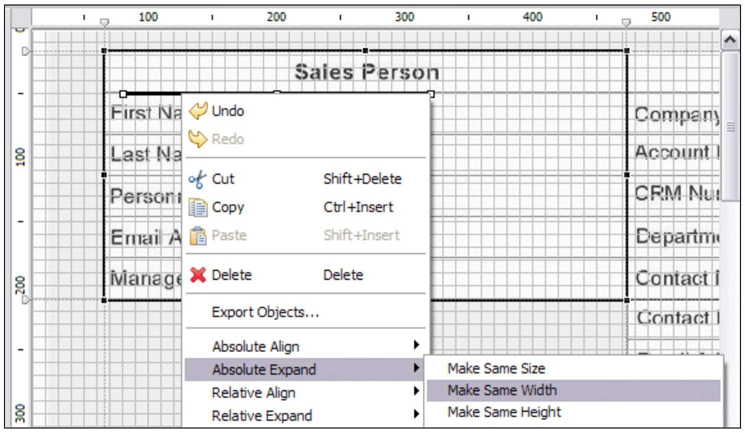


Figure 5-31 Place first horizontal line on the form

We are still not concerned about aligning the line to the left or right. Select that line in the canvas and copy it using Ctrl+C. Paste the copy of the line into the form canvas using Ctrl+V. You should paste enough horizontal lines to account for all of the horizontal lines of the sales person section of the form. (There are four more lines needed.) Lay the new lines over the horizontal lines of the layout shown in the template so that all horizontal lines are covered, as shown in Figure 5-32.

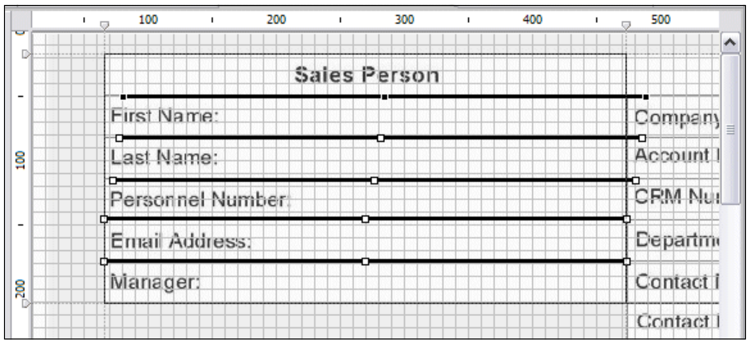


Figure 5-32 Line up new lines over existing horizontal lines of the template

Next use absolute alignment to line up all of the new lines left to left with the box, as shown in Figure 5-33.

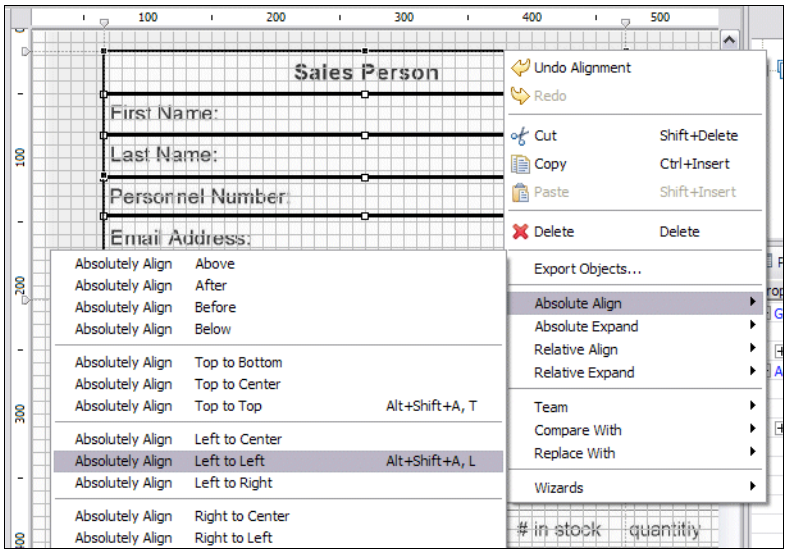


Figure 5-33 Absolute align left to left the new lines to the box

Once you have placed all lines and the box on your form, preview and print the form to check that everything lines up correctly and prints properly. If necessary, repeat the preview, correction, and modification process until you have resolved all problems with the form.

Place labels and fields

We add our labels and fields to the form. We are going to show you two methods to accomplish this task. First, we show you how to use the items in the palette to create your labels and fields for the employee section of the form, and then link the fields to the data instances of the XForms Model. Then in the next section we show how to use the XForms Model data instances to create fields and labels with the links in place.

Create labels and fields using the palette

We begin at the top of the page and work through the sales person section of the form placing labels on the form. Our approach is to create a single label for the first item in the table and get it as close to the original as possible with alignment and font. We then use the Non-XForms label items for this part. As shown in Figure 5-34, click the label menu and select the **Non-XForms** item, then click the location in your form canvas to insert the item.

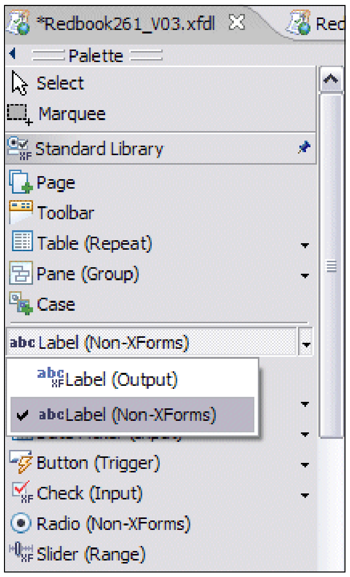
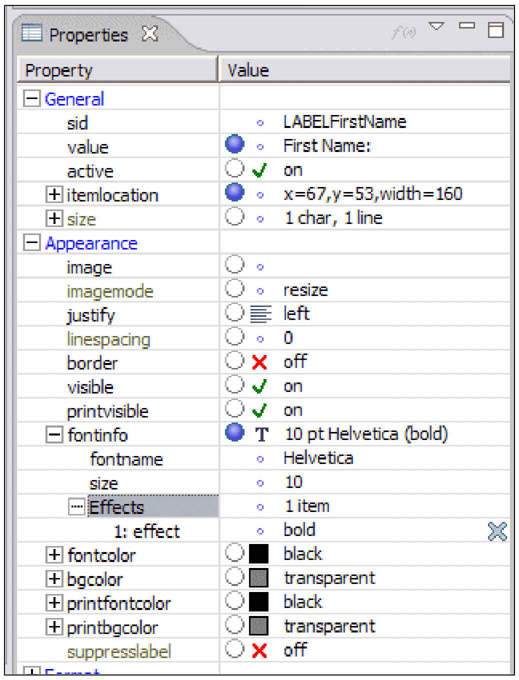


Figure 5-34 Non-XForms label

Try to match font, color, size, and label values as closely as possible. You can then copy that label and reuse it for the other labels in the sales person table. This speeds up the process. The label properties we used are shown in Figure 5-35.


Properties

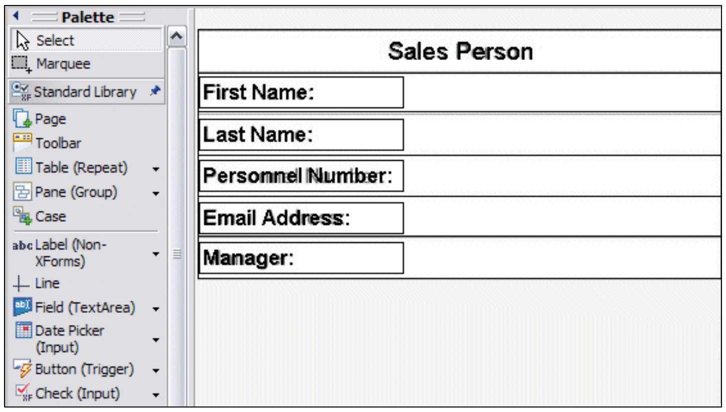
Property	Value
General	
sid	LABELFirstName
value	First Name:
active	✓ on
itemlocation	x=67,y=53,width=160
size	1 char, 1 line
Appearance	
image	
imagemode	resize
justify	left
linespacing	0
border	✗ off
visible	✓ on
printvisible	✓ on
fontinfo	10 pt Helvetica (bold)
fontname	Helvetica
size	10
Effects	1 item
1: effect	bold
fontcolor	■ black
bgcolor	▨ transparent
printfontcolor	■ black
printbgcolor	▨ transparent
suppresslabel	✗ off

Figure 5-35 Label properties

When placing your labels for the header it is a good idea to extend the borders of your label to the full size of the existing box shown in the original form template. Making this effort now allows us to differentiate by background color the headers from fields in the table later. Although distinction between columns is not how the original form was created, improving the look and feel should always be considered. It is a way to bring additional value to the form, without deviating too far away from the original design. We show how to improve the layout of this form in 5.7, “Enhancing the form” on page 278.

Note: The decision to use relative or absolute alignment can make a significant difference for layout items. Generally speaking, you should only use relative align when the size or position of items on your form may vary (for example, when your form is receiving data from a database or when sections of your form are created dynamically). The same is true of relative expand.

Once you have added the labels to the sales person table it should look like the section shown in Figure 5-36.



Sales Person

First Name:

Last Name:

Personnel Number:

Email Address:

Manager:

Figure 5-36 Sales person section

Next we add fields to the form. The process is very similar, except this time we select a specific XForms version. Go to your palette and, using the drop-down list for fields, select the **Field (Input)** item from the list and drop it in your form canvas, as shown in Figure 5-37. This is an important difference because, unlike labels, which do not need to be bound to the XForms Model, we know that ultimately the fields will need to be bound.

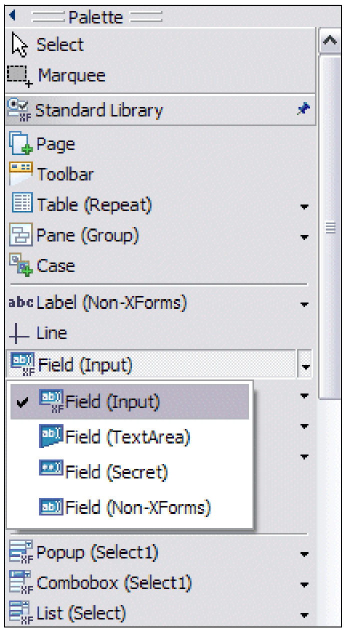
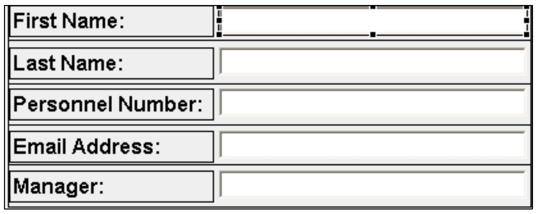


Figure 5-37 XForms Field (Input)

Again, it is a good idea to define the properties and alignment for the first field and then copy and paste it as needed to complete the sales person table. We accept the default values for all of the properties except SID, which we rename to reflect the value that is stored in the field. We then copy that field and paste it four times. Next, we use absolute alignment to place each field after its associated label. The sales person table should look like the image shown in Figure 5-38.



First Name:	
Last Name:	
Personnel Number:	
Email Address:	
Manager:	

Figure 5-38 Sales person section with fields and labels

5.6.2 Define references (XPath)

The next step required to complete this section of the form is to link the field items to the data instances, as defined by the XForms Model. This is a critical step. XForms items must be linked to a data instance utilizing an XPath expression. If the XPath expressions are not defined for your XForms items, then the form will not function as designed.

In this section we cover the following topics:

- ► Data instance
- ► Error messages
- ► Resolving reference errors

Data instance

We use the data elements of the EmployeeDetails instance shown in Example 5-3 to bind our items.

Example 5-3 EmployeeDetails

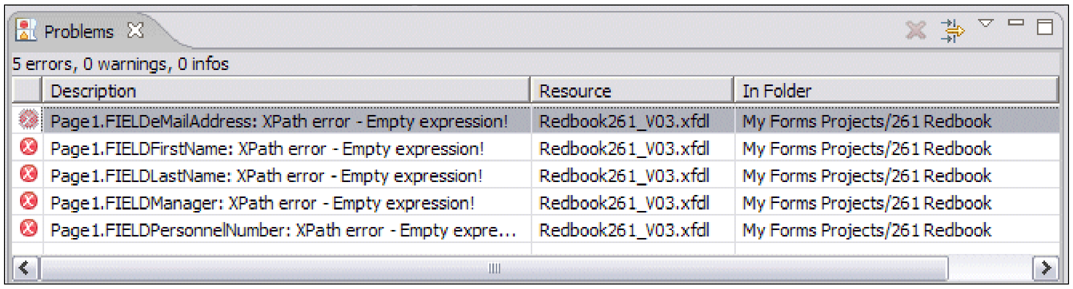
```
<!-- Detail Data for the Indicated Employee (previously FormOrgData)-->

<xforms:instance id="EmployeeDetails" xmlns="">
   <EmployeeDetails>
      <Employee>
         <FirstName></FirstName>
         <LastName></LastName>
         <ID></ID>
         <ContactInfo></ContactInfo>
         <Manager></Manager>
      </Employee>
   </EmployeeDetails>
</xforms:instance>
```

Note: For more information about references see Chapter 2, “Features and functionality” on page 19.

Error messages

Fortunately, the Designer catches these errors and warns the form designer immediately in a few ways. Because there are no binds from our XForms Model instances to the XForms

Designer items, several problems have been identified and are listed in the Problems view of our Designer, as shown in Figure 5-39.



5 errors, 0 warnings, 0 infos

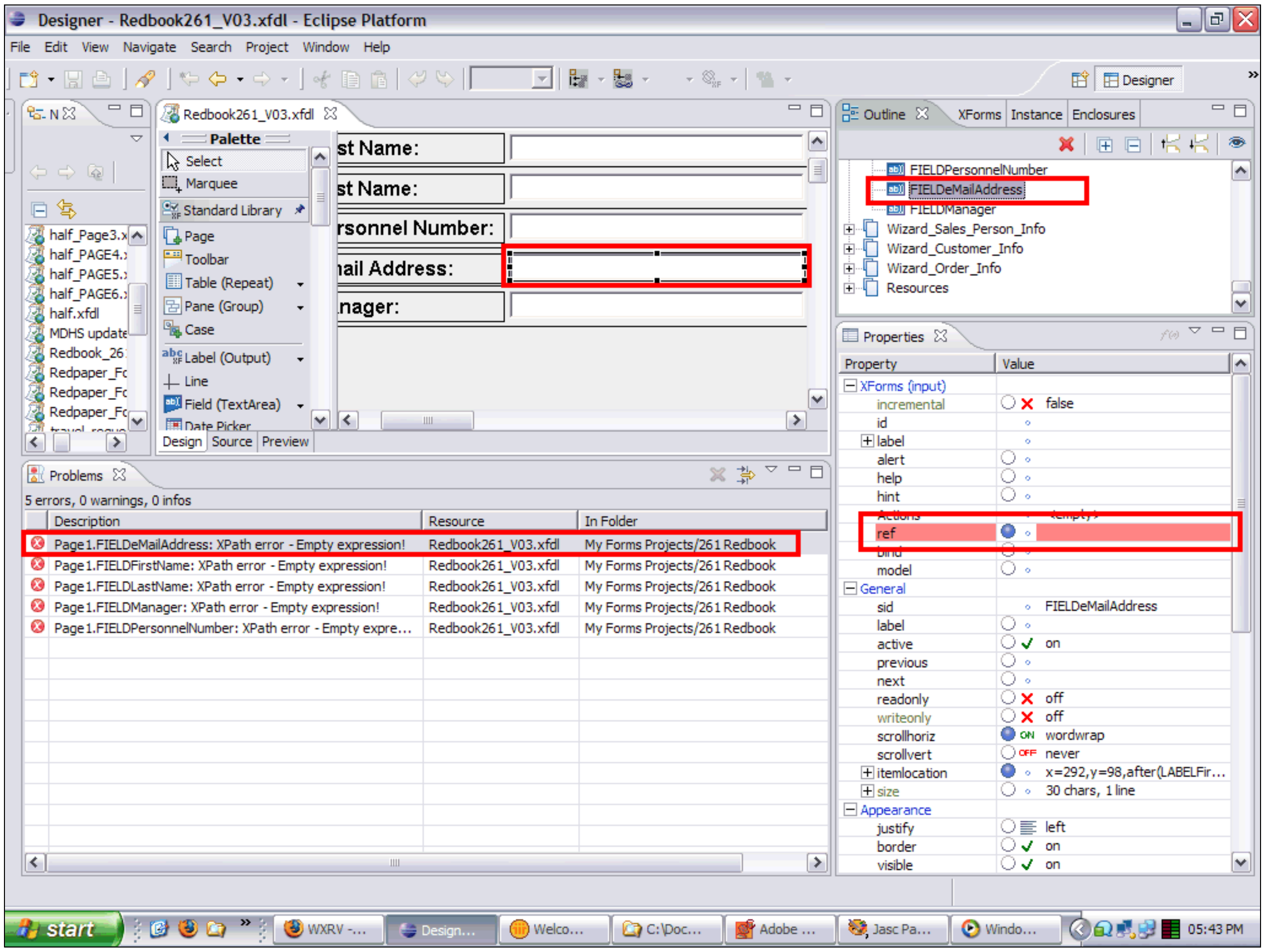
Description	Resource	In Folder
Page1.FIELDeMailAddress: XPath error - Empty expression!	Redbook261_V03.xfdl	My Forms Projects/261 Redbook
Page1.FIELDFirstName: XPath error - Empty expression!	Redbook261_V03.xfdl	My Forms Projects/261 Redbook
Page1.FIELDLastName: XPath error - Empty expression!	Redbook261_V03.xfdl	My Forms Projects/261 Redbook
Page1.FIELDManager: XPath error - Empty expression!	Redbook261_V03.xfdl	My Forms Projects/261 Redbook
Page1.FIELDPersonnelNumber: XPath error - Empty expre...	Redbook261_V03.xfdl	My Forms Projects/261 Redbook

Figure 5-39 XPath expression is empty

In fact, a warning is highlighted in the Properties view for each XForms field. To find out more about the warnings in the Properties view, double-click one of the errors described in the Problems view. A few things happen:

- First, the XForms item with the problem gains focus on the Design canvas.
- Second, the outline is highlighted.
- Third, the Properties view expands to show which field attribute needs to be defined.

This is an especially helpful feature because you know not only that there is a problem, but just by double-clicking the warning shown in the Problems view you now know where on the form, where in the outline, and what property needs to be defined to resolve the issue. Figure 5-40 shows all of these items highlighted in red boxes.



Problems

5 errors, 0 warnings, 0 infos

Description	Resource	In Folder
Page1.FIELDeMailAddress: XPath error - Empty expression!	Redbook261_V03.xfdl	My Forms Projects/261 Redbook
Page1.FIELDFirstName: XPath error - Empty expression!	Redbook261_V03.xfdl	My Forms Projects/261 Redbook
Page1.FIELDLastName: XPath error - Empty expression!	Redbook261_V03.xfdl	My Forms Projects/261 Redbook
Page1.FIELDManager: XPath error - Empty expression!	Redbook261_V03.xfdl	My Forms Projects/261 Redbook
Page1.FIELDPersonnelNumber: XPath error - Empty expre...	Redbook261_V03.xfdl	My Forms Projects/261 Redbook

Properties

Property	Value
XForms (input)	
incremental	false
id	
label	
alert	
help	
hint	
Actions	<empty>
ref	
bind	
model	
General	
sid	FIELDeMailAddress
label	
active	on
previous	
next	
readonly	off
writeonly	off
scrollhoriz	wordwrap
scrollvert	never
itemlocation	x=292,y=98,after(LABELFir...
size	30 chars, 1 line
Appearance	
justify	left
border	on
visible	on

Figure 5-40 XForms errors highlighted in the Designer perspective

Based on what we see here we know that on Page1, there is a XForms field named FIELDeMailAddress with an empty XPath expression that needs to be defined in the item's Property view in the XForms section for the ref attribute (abbreviation of *reference*).

Resolving reference errors

There are several ways to resolve reference errors:

- Directly edit the source code.
- Copy the reference.
- Drag and drop instance.

In the following subsections we show how to resolve these issues using all three methods listed above. The method to use is a matter of personal preference and comfort level. There is no right or wrong way to correct reference issues, but as you see later in this section, there are other approaches that can be used that help you to avoid reference issues when designing your forms.

Directly edit the source code

Code developers may choose to resolve the issue in the source code for the form by properly defining the reference. Click the **Source** tab located in the lower left corner of your Design canvas. Since the item with the issue is highlighted on the canvas, the Designer sets focus directly on the associated code in the Source view.

When we look at the code shown in Example 5-4 we see that the ref is nil.

Example 5-4 Source view of the field declaration with the error

```
<field sid="FIELDeMailAddress">
   <xforms:input ref="">
      <xforms:label></xforms:label>
   </xforms:input>
   <itemlocation>
      <x>292</x>
      <y>98</y>
      <after>LABELFirstName</after>
      <width>240</width>
      <alignvertc2c>LABELFirstName</alignvertc2c>
      <after>LABELeMailAddress</after>
   </itemlocation>
   <scrollhoriz>wordwrap</scrollhoriz>
```

Now we can go to the XForms Model definition and identify what the reference should be. Look at the instance code in Example 5-5.

Example 5-5 XForms Model instance definition for sales person data

```
<!-- Detail Data for the Indicated Employee (previously FormOrgData)-->

<!-- Detail Data for the Indicated Employee (previously FormOrgData)-->
   <xforms:instance id="EmployeeDetails" xmlns="">
      <EmployeeDetails>
         <Employee>
            <FirstName></FirstName>
            <LastName></LastName>
            <ID></ID>
            <ContactInfo></ContactInfo>
            <Manager></Manager>
         </Employee>
      </EmployeeDetails>
   </xforms:instance>
```

We can see here that the data instance for e-mail address is stored in the <ContactInfo> element of the data instance EmployeeDetails instance, in the Employee node. Therefore, our XPath reference definition should be as shown in Example 5-6.

Example 5-6 XPath reference definition

```
instance('EmployeeDetails')/Employee/ContactInfo
```

Now we can modify our XForms item definition with the appropriate reference value. In the source view return to our FIELDeMailAddress section. Modify the reference to properly call to the instance data that will be tied to that field, as shown in Example 5-7.

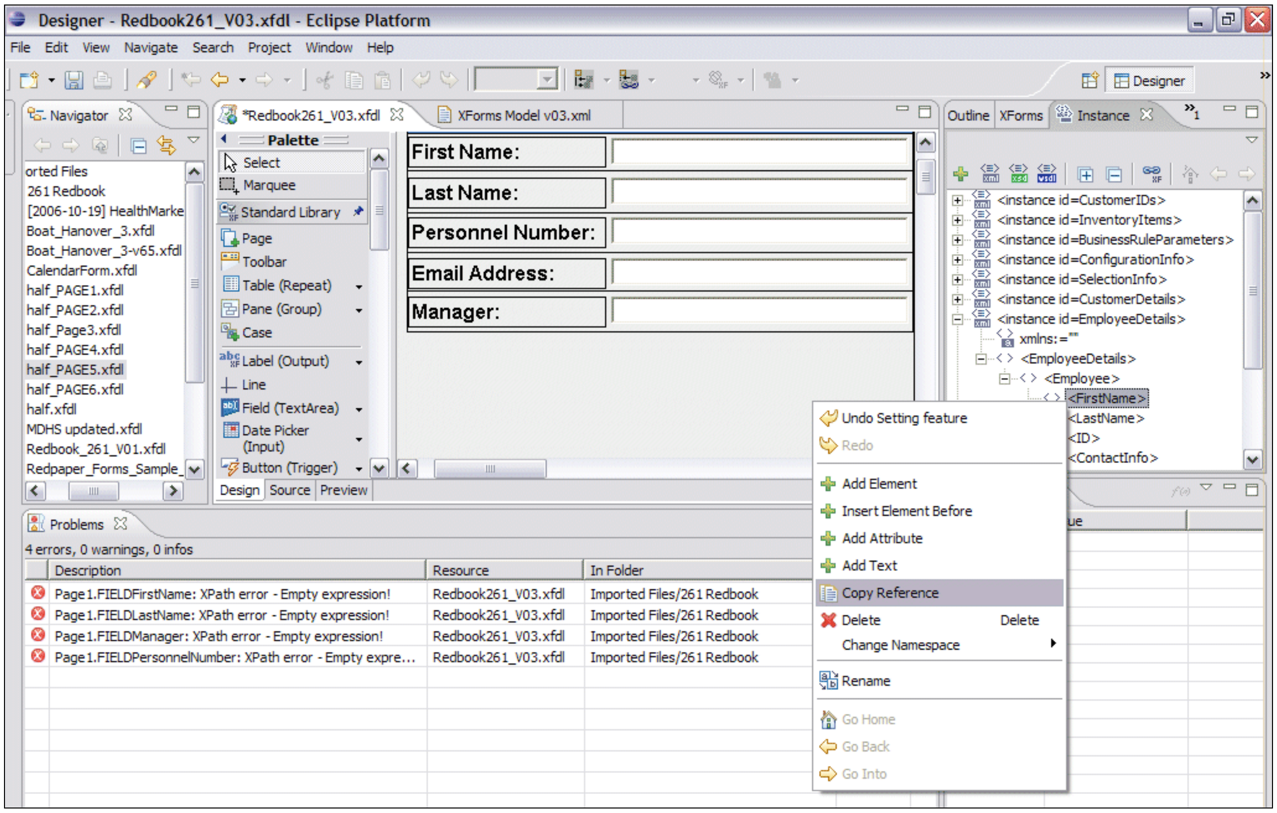
Example 5-7 Declare XPath

```
<field sid="FIELDeMailAddress">
   <xforms:input ref="instance('EmployeeDetails')/Employee/ContactInfo">
   <xforms:label></xforms:label>
   </xforms:input>
      <itemlocation>
      <x>292</x>
      <y>98</y>
      <after>LABELFirstName</after>
      <width>240</width>
      <alignvertc2c>LABELFirstName</alignvertc2c>
      <after>LABELeMailAddress</after>
   </itemlocation>
   <scrollhoriz>wordwrap</scrollhoriz>
</field>
```

Press Ctrl+S to save your changes and recompile your source code. Return to the Design canvas by clicking the **Design** tab in the lower left-hand corner of your Source editor. When the view refreshes, look at the Field Properties view. Our change is shown. Also, look at the Problems view. The issue for the e-mail instance is resolved.

Copy the reference

We now have four other references to resolve. For the First Name field we resolve the reference issue by copying the reference from the Instance view and pasting it into the field's reference property. Go to the Instance view and locate the first name element in the employee data instance. Then right-click the **FirstName** data element in the instance and select **Copy Reference** from the pop-up window, as shown in Figure 5-41.



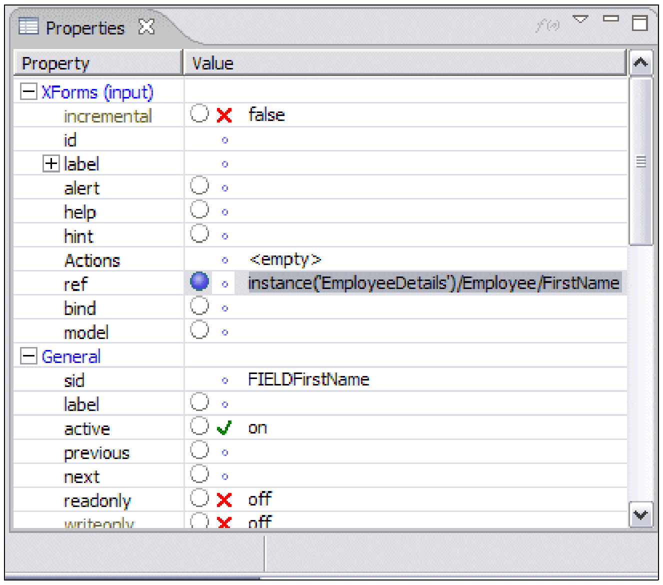
Problems

4 errors, 0 warnings, 0 infos

Description	Resource	In Folder
Page1.FIELDFirstName: XPath error - Empty expression!	Redbook261_V03.xfdl	Imported Files/261 Redbook
Page1.FIELDLastName: XPath error - Empty expression!	Redbook261_V03.xfdl	Imported Files/261 Redbook
Page1.FIELDManager: XPath error - Empty expression!	Redbook261_V03.xfdl	Imported Files/261 Redbook
Page1.FIELDPersonnelNumber: XPath error - Empty expre...	Redbook261_V03.xfdl	Imported Files/261 Redbook

Figure 5-41 Copy reference

Click the first name field item in our Design canvas and look at the properties for it. In the Properties view, expand the **XForms (Input)** section. Notice that the ref property is still highlighted in red. Click the value section next to the ref properties, and press Ctrl+V to paste the reference that we just copied. When finished it should appear as shown in Figure 5-42.

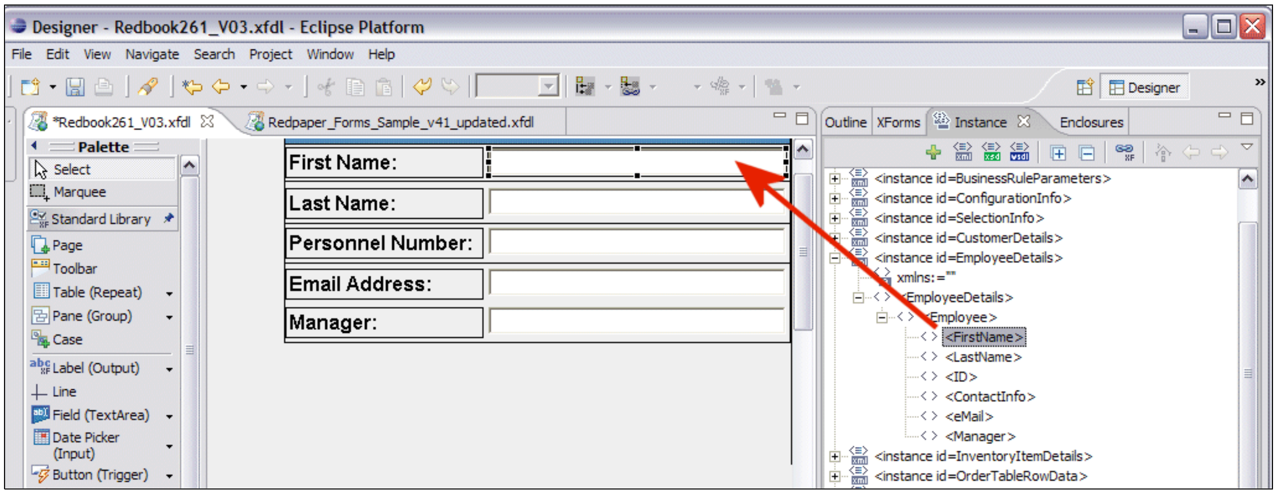


Property	Value
⊟ XForms (input)	
incremental	○ ✗ false
id	
⊞ label	
alert	○
help	○
hint	○
Actions	<empty>
ref	● instance('EmployeeDetails')/Employee/FirstName
bind	○
model	○
⊟ General	
sid	FIELDFirstName
label	○
active	○ ✓ on
previous	○
next	○
readonly	○ ✗ off
writeonly	○ ✗ off

Figure 5-42 Paste reference

Drag and drop instance

That leaves us with just three items left. To resolve these problems we are going to return to the Instance view. Locate the appropriate instance and then drag and drop the instance to the associated field item, as shown in Figure 5-43. This defines the references needed to link the UI elements to the data instances and completes this section.



```
<instance id=BusinessRuleParameters>
<instance id=ConfigurationInfo>
<instance id=SelectionInfo>
<instance id=CustomerDetails>
<instance id=EmployeeDetails>
   xmlns:=""
   <EmployeeDetails>
      <Employee>
         <FirstName>
         <LastName>
         <ID>
         <ContactInfo>
         <eMail>
         <Manager>
<instance id=InventoryItemDetails>
<instance id=OrderTableRowData>
```

Figure 5-43 Drag and drop instance reference to field item

Use any of the three methods just covered to complete the mapping of the sales person section.

5.6.3 XForms Model method

As mentioned earlier, using an XForms Model instance to create layout items on the form is a more efficient way to accomplish our goal. It does require a complete XForms Model with all of the necessary instances defined in advance. That is not to say that changes or enhancements cannot be made later. You can always go back and modify the instances. However, you have to be aware of the impact to references, binds, and computes that may be affected. Fortunately, we have our instances in place.

In this section we cover the following topics:

- Data instance
- Highlighting bound XForms items
- Drag and drop instance node onto form
- Resolve missing XForms binds
- Layout instance items

Data instance

We use the CustomerDetails instance, as shown in Example 5-8, to create our customer details section of the form.

Example 5-8 CustomerDetails instance

```
<!-- Detail data for the Selected Customer -->

<xforms:instance id="CustomerDetails" xmlns="">
   <CustomerDetails>
      <Customer>
         <ID></ID>
         <Name></Name>
         <AccountManagerID></AccountManagerID>
         <Department></Department>
         <ContactName></ContactName>
         <ContactPosition></ContactPosition>
         <ContactEmail></ContactEmail>
         <ContactPhone></ContactPhone>
         <CRMNumber></CRMNumber>
      </Customer>
   </CustomerDetails>
</xforms:instance>
```

Highlighting bound XForms items

Before we begin working directly with XForms instances, we discuss some of the tools we can use to identify items and possible issues with XForms binds. You can analyze the XForms items you have in the Design editor to see whether they have been bound. You can do this from the View menu or the Designer’s toolbar:

- Select **View** → **Highlight Items with XForms Binds**. Use this option to highlight XForms items that are associated with XML instance elements.
- Select **View** → **Highlight Missing XForms Binds**. Use this option to highlight XForms items that do not reference XML instance elements.
- Select **View** → **Turn off Highlight Mode**. Use this option to turn off the highlighting for XForms items with or without references. These options rotate through a three-way state change in the View menu.

Note: The highlight color can be customized in the Designer's preferences.

Before we begin, we turn on another XForms feature in the Designer. In the Designer Toolbar, locate and turn on the Highlight Missing XForms Binds option, and select it, as shown in Figure 5-44.

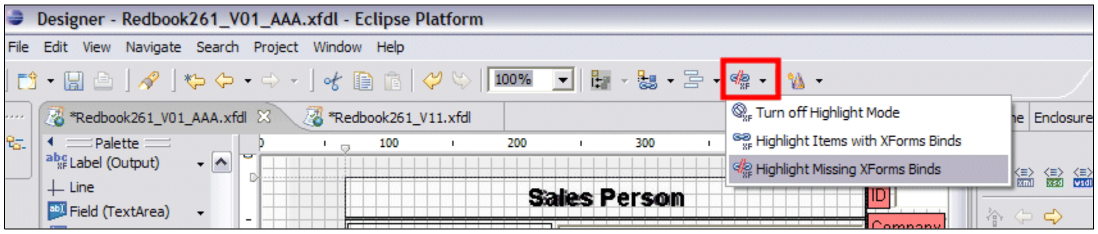

Designer - Redbook261_V01_AAA.xfdl - Eclipse Platform
File Edit View Navigate Search Project Window Help
Turn off Highlight Mode
Highlight Items with XForms Binds
Highlight Missing XForms Binds
Sales Person

Figure 5-44 Highlight Missing XForms Binds

This highlight feature allows us to more quickly and easily identify any issues that may arise when working directly with the XForms Model instance data.

Drag and drop instance node onto form

Using the Instance view, drag and drop the <Customer> node onto an empty area of the form, as shown in Figure 5-45. This automatically generates the presentation layer items necessary to represent the <Customer> node. When we look at the object, we see that all of the labels and fields have been created on the form and are contained within an XForms pane of type group.

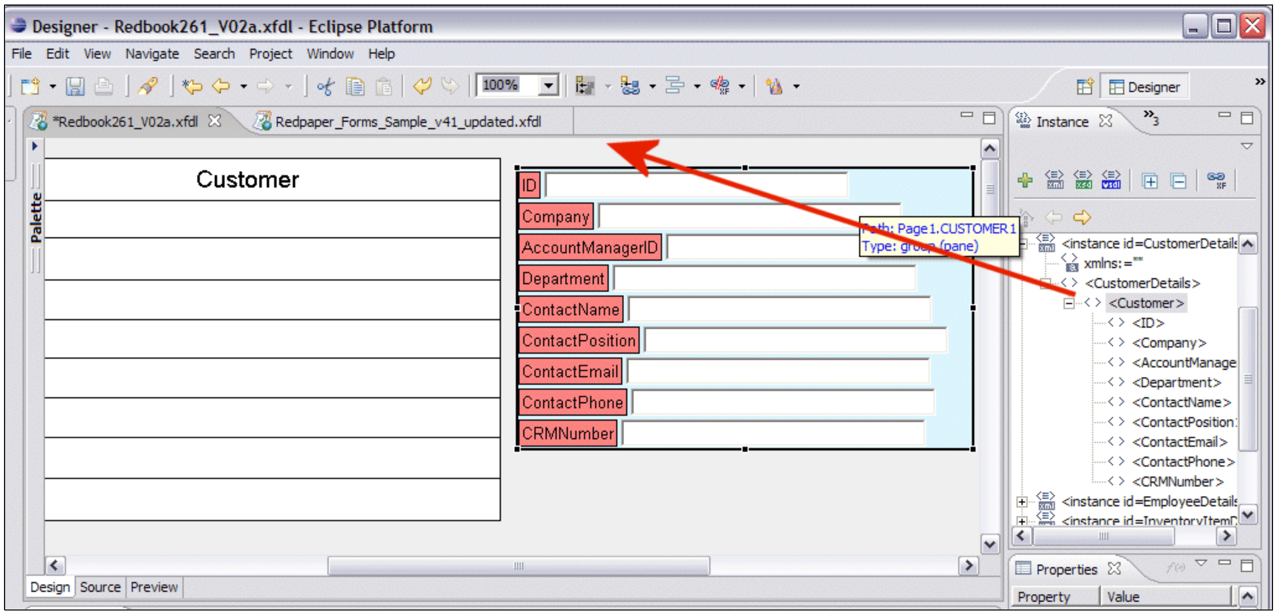


Figure 5-45 Drag and drop the entire customer instance

Resolve missing XForms binds

Notice that all of the field items are appropriately bound to the XForms Model data elements, but the labels are missing XForms binds. This is not a critical error, so it does not need to be resolved, but if we like it can be resolved quickly by converting the labels to XFDL label items. To convert the items select all of the labels, and then right-click to select **Convert Item** →

XFDL Label, as shown in Figure 5-46. When finished, the labels are no longer highlighted because XFDL items do not require binds.

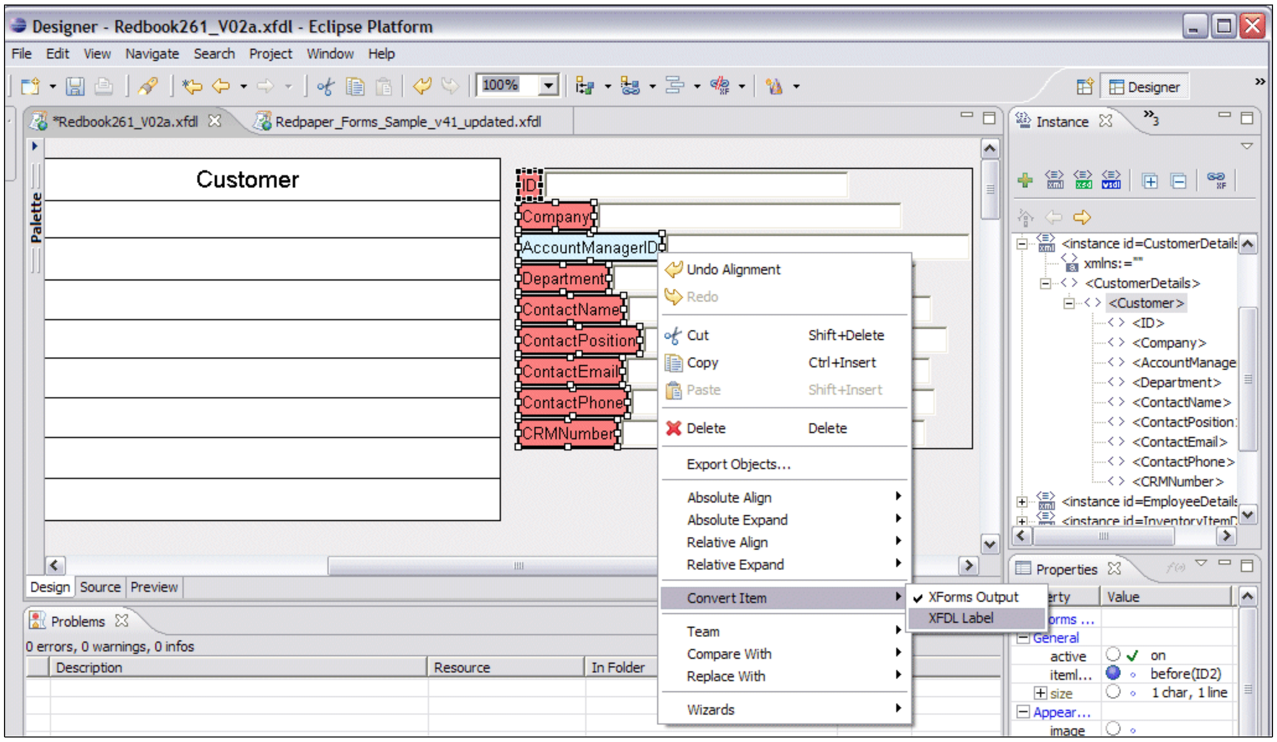


Figure 5-46 Convert label items to XFDL

Layout instance items

If we were creating the form without regard for the original forms design, then all we would need to do is add a header to this XForms pane and place the pane next to our sales person section. However, we want to mimic the original layout as closely as possible, so we are going to have to add a header to the pane and reorientate the label and field items as well. We begin by aligning the XForms pane representing our customer section next to the sales person section on the form.

We cover the following topics in this subsection:

- Position pane
- Change build order and remove relative alignment
- Remove unnecessary items
- Resize labels
- Realign fields
- Add header

Position pane

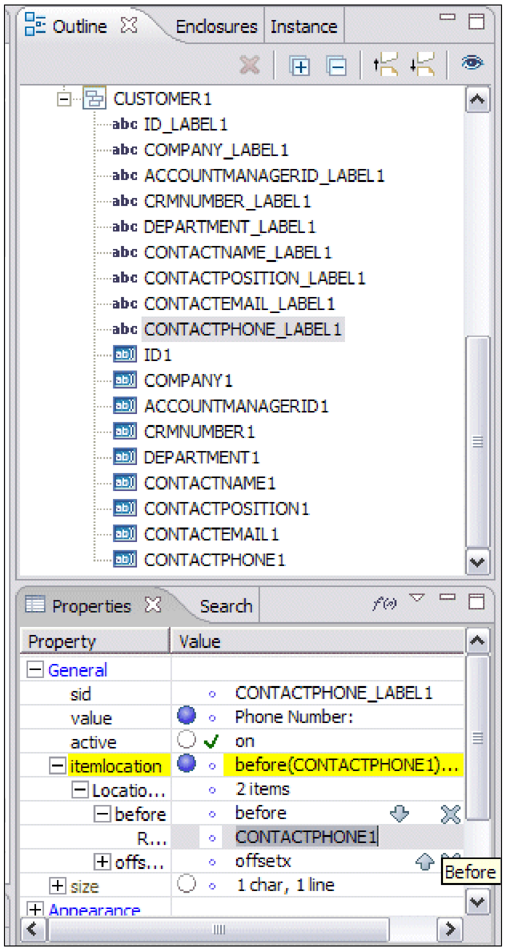
Select the XForms pane, Customer1, with your cursor and drag it over to the grid lines surrounding the sales person section. Notice that when you drag the pane, all of the labels and field items move along with it. That is because the Customer1 pane of type group is in fact a container of those items.

Change build order and remove relative alignment

When an instance is used to create the items, labels are relative aligned before their associated fields by default. Although this is fine in most cases, it creates an issue for us. We need to align our items to the existing template for the form and the only point of reference that we have for alignment of these items is the existing labels on the template. We have to remove the relative alignment properties for the labels. Since this section is not dynamic, we can actually use absolute alignment and expansion tools to move the labels and fields into the appropriate locations.

Tip: Relative alignment is very useful when you need to keep certain items together. However, should you need to realign items, any relative alignment rules defined between items can cause undesired affects. Keep this in mind when defining relative alignment rules, and be prepared to remove or redefine existing alignment rules.

We start by reordering the items in the Outline view. This changes the build order and breaks the default relative alignment rules. Move the label items to the top of the Customer1 pane of the Outline view. Remove the relative alignment definitions from the Properties view inside the itemlocation section. Since relative alignment properties are unique to each item, they cannot be removed for more than one item at a time, so it is usually more efficient to reorder and change the alignment for each item at the same time (see Figure 5-47).



CUSTOMER1
- ID_LABEL1
- COMPANY_LABEL1
- ACCOUNTMANAGERID_LABEL1
- CRMNUMBER_LABEL1
- DEPARTMENT_LABEL1
- CONTACTNAME_LABEL1
- CONTACTPOSITION_LABEL1
- CONTACTEMAIL_LABEL1
- CONTACTPHONE_LABEL1
- ID1
- COMPANY1
- ACCOUNTMANAGERID1
- CRMNUMBER1
- DEPARTMENT1
- CONTACTNAME1
- CONTACTPOSITION1
- CONTACTEMAIL1
- CONTACTPHONE1

Property	Value
General	
sid	CONTACTPHONE_LABEL1
value	Phone Number:
active	on
itemlocation	before(CONTACTPHONE1)...
Locatio...	2 items
before	before
R...	CONTACTPHONE1
offs...	offsetx
size	1 char, 1 line
Appearance	

Before

Figure 5-47   Rearrange Items

Remove unnecessary items

Before we begin to lay out the items of the Customer pane, there are two items included in the instance that are required for form logic, but not needed in the presentation layer. The ID label and ID field items can be deleted from the presentation layer, but are still required for the instance in the XForms Model.

Resize labels

Select all of the remaining labels and set the font properties equal to those defined for the label items in the sales person section, then use your mouse and arrow keys to align the labels over the template. Once all of the labels are in place, use absolute expand to resize all of the labels to the same width as the largest label on the form, as shown in Figure 5-48.

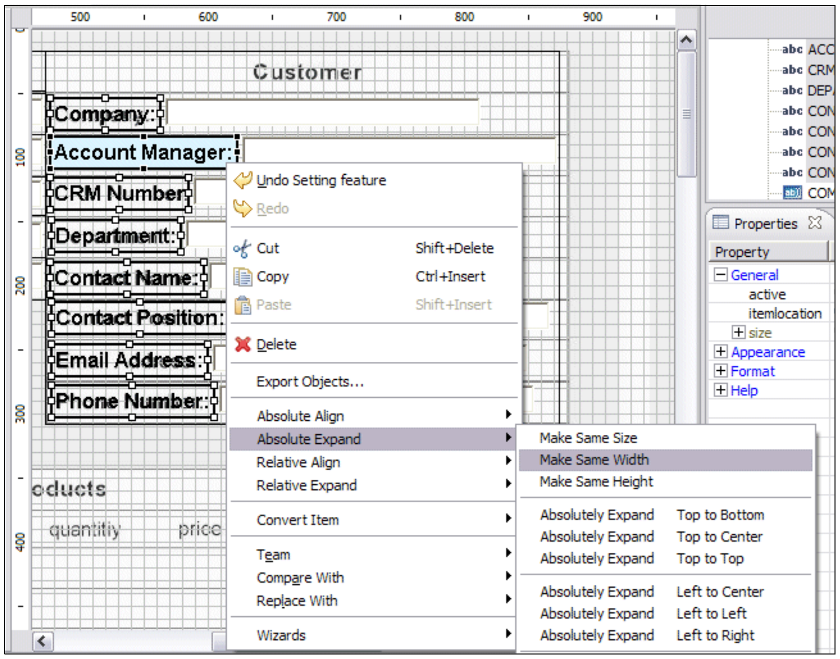


Figure 5-48 Make same width

Realign fields

This is an instance where relative alignment can be useful for designing a form. Even though this is not a dynamic section of our form, using relative alignment here allows us to keep the labels and field items together. Use relatively align after to place the associated fields after their labels, as shown in Figure 5-49.

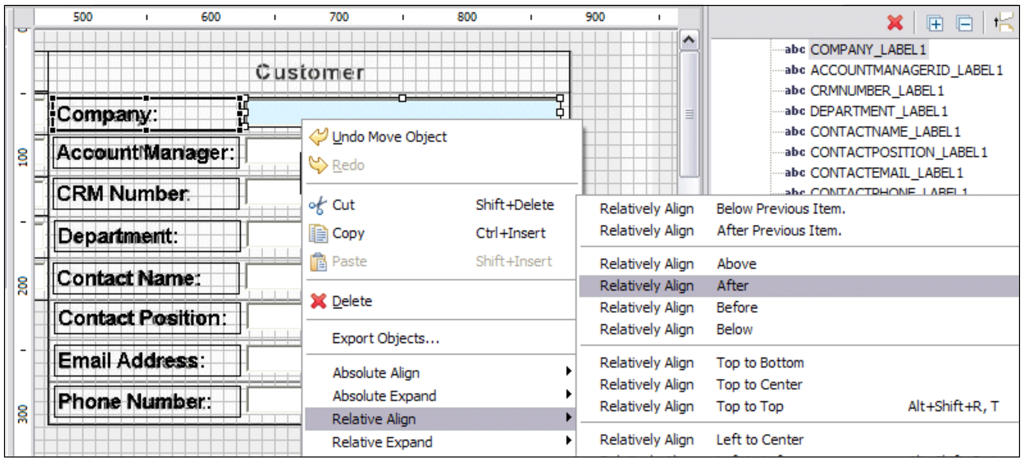


Figure 5-49 Relative align after

Add header

The last step to complete this process is to add a new non-XForms label to the form for the header of our customer section. Add a new label inside the pane, define the font properties to match that of the sales person section header, and then align it appropriately.

Tip: Make the label area the same size (height and width) as the area shown in the form template. This is helpful later when we need to add formatting to the form.

When finished the table should look similar to the one shown in Figure 5-50.

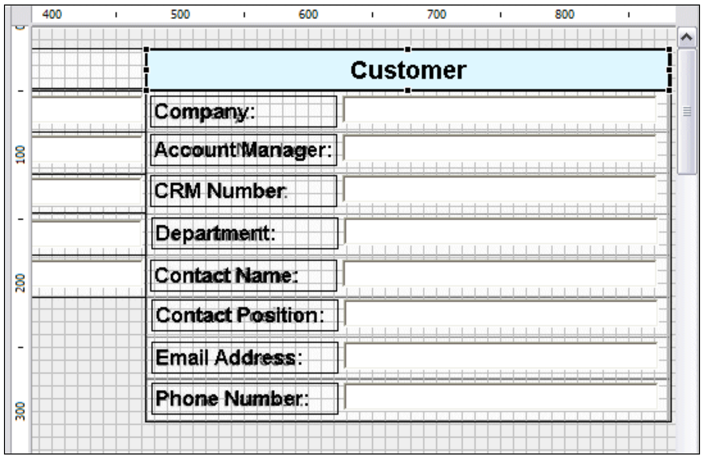


Figure 5-50 Customer pane complete

5.6.4 Create dynamic XForms table

In the original form there is a products table used to enter order details. We recreate it using more advanced functions of the Workplace Forms Designer. There are a number of issues with the original paper-based form that can be overcome:

- Static number of rows: There are only five rows in the original form. We can make this table dynamic and allow for any number of rows that may be needed so that if a customer wanted to order 10 items we could her them the opportunity to do so without having to put the information on a second form or onto an attached sheet of paper that could be lost.
- Calculations: The form requires that the sales associate calculate discounts and totals. We can build that logic into the electronic form using computes and binds.
- List items: There are a couple of fields such as sales item number and name that need to be populated with information contained in backend systems. We can create a predefined list of these items to limit choices and reduce errors. (Later we connect to a backend system to automatically populate these lists when the form loads.)
- Current stock: One field requires that the total number of sales item available in stock be entered. With a paper-based form, a sales associate would need to identify that value before completing the order so that he did not sell more items than available. We can design the form now using an XForms Model that allows us to later connect directly to the database and automatically populate that field based on the sales item selected.
- Discount: The available discounts are static values: no discount (0), 10%, 20%, and 30%. Again we can reduce errors and speed completion by providing the end user with a list of these values. Also, by controlling the data input we can ensure that our computes and binds function without error.

We use the OrderTableRowData instance shown in Example 5-9 to build our table. It provides us with a number of child elements, which represent the columns for our table.

Example 5-9 OrderTableRowData instance

```
<!-- Row Data for the Selected Item -->

<xforms:instance id="OrderTableRowData" xmlns="">
   <OrderTableRowData>
      <Row>
         <line>
            <id></id>
            <name></name>
            <price></price>
            <stock></stock>
            <amount></amount>
            <discount></discount>
            <line_total></line_total>
            <subtotal></subtotal>
         </line>
      </Row>
   </OrderTableRowData>
</xforms:instance>
```

Create table

A wizard is used to create the table. After we have it in place, lists of items and binds are created. Select the **Table (Repeat) by Wizard** item from the Designer palette (see Figure 5-51) and place it on your form canvas.

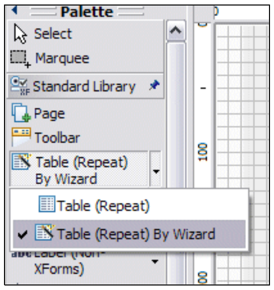


Figure 5-51 Create table with wizard

A guided wizard interface is launched. On the first screen select **Advanced Setup (using existing data)**, as shown in Figure 5-52. Then click **Next**.

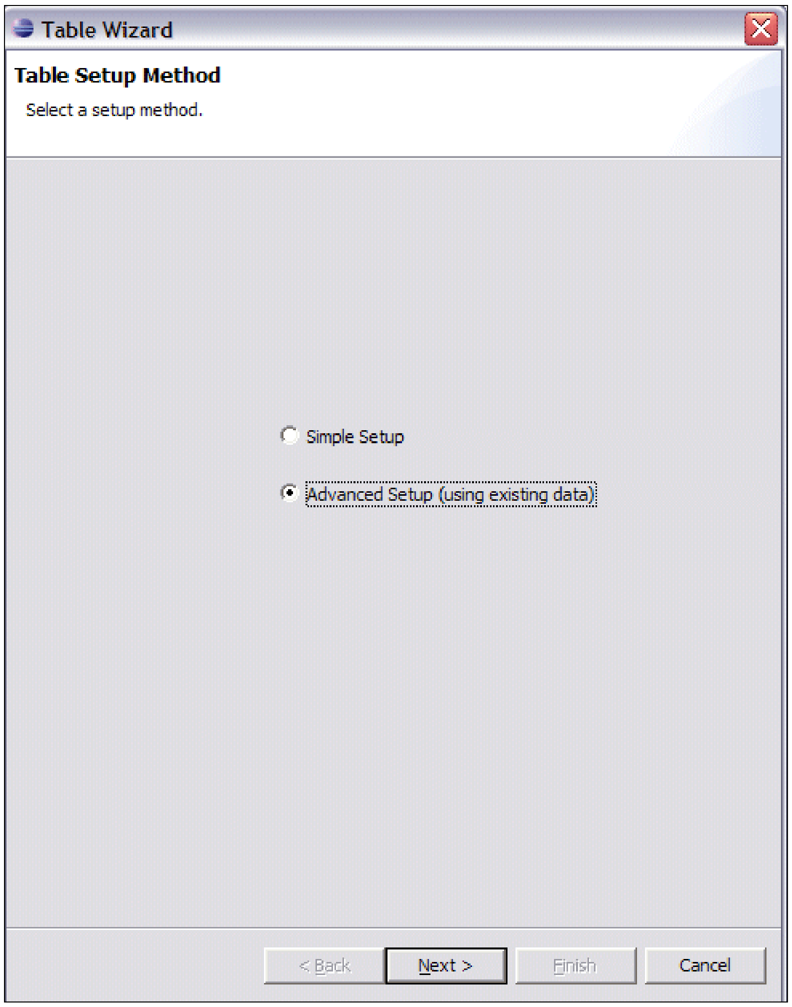


Figure 5-52 Advanced setup

On the next screen of the wizard we are prompted to select the instance to be used for the table. Based on the data instances provided to us we know that the OrderTableRowData instance is used.

Note: Looking at the instance we can see that it does not contain all of the required fields needed to build our table. That is not a problem. We can modify the table that is generated to include additional fields.

Select the **OrderTableRowData** instance from the instances shown in the left-hand column, then select the **line** node, as shown in Figure 5-53. The child elements of the node make up the columns of the table. Click **Next**.

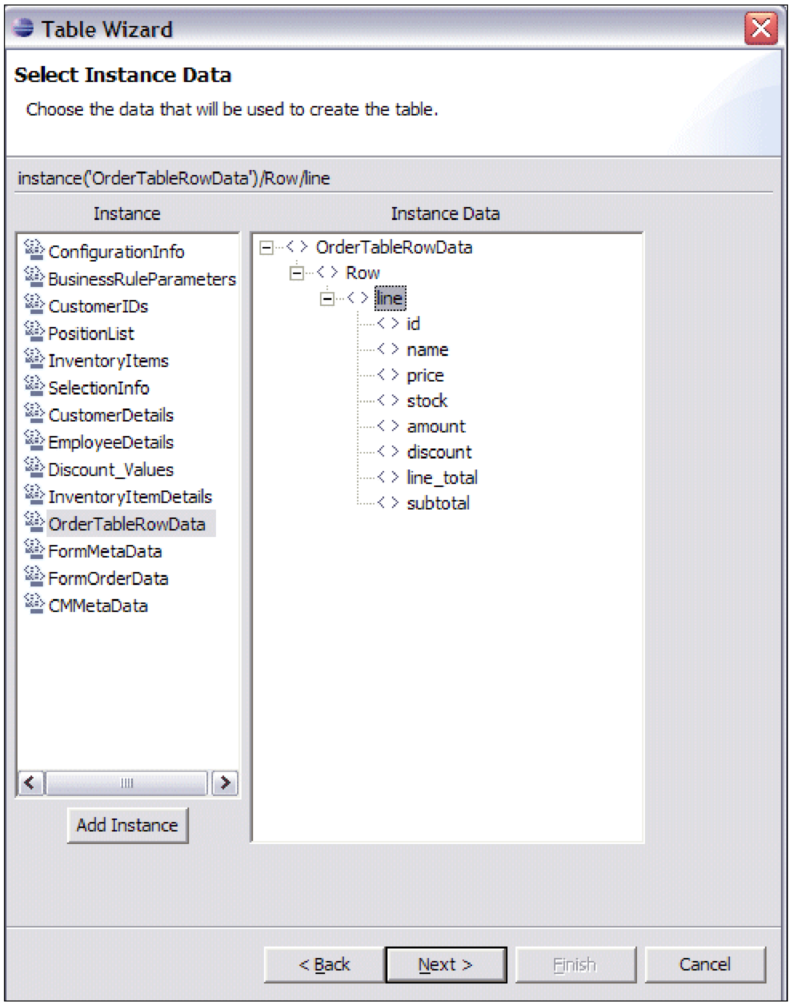
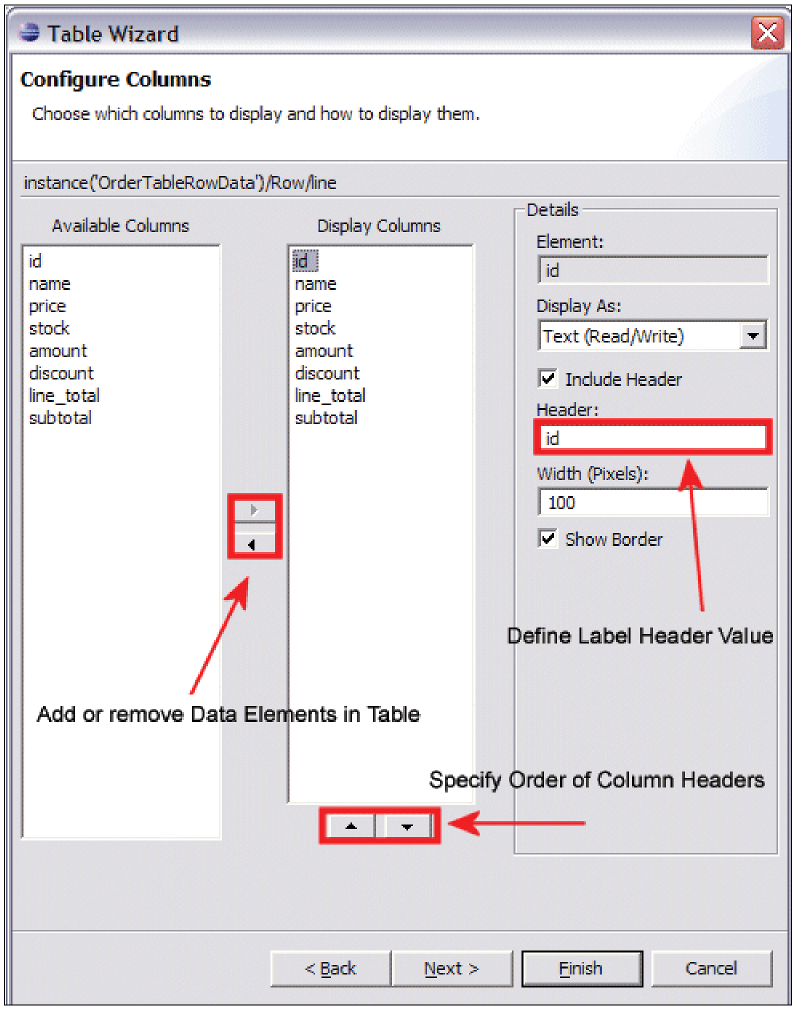


Figure 5-53   Select node

On the next screen we are prompted by the wizard to configure our columns. Changes can be made here to reorder our columns, specify column widths, define headers, and add or remove data elements in the table, as shown in Figure 5-54.



Configure Columns

Choose which columns to display and how to display them.

instance('OrderTableRowData')/Row/line

Available Columns	Display Columns
id	id
name	name
price	price
stock	stock
amount	amount
discount	discount
line_total	line_total
subtotal	subtotal

Details

Element: id

Display As: Text (Read/Write)

[✓] Include Header

Header: id

Width (Pixels): 100

[✓] Show Border

Define Label Header Value
Add or remove Data Elements in Table
Specify Order of Column Headers
< Back
Next >
Finish
Cancel

Figure 5-54 Configure Columns

We do not need to add or remove any items, but we should reorder the columns. Use the up and down arrows to put the display columns in the following order:

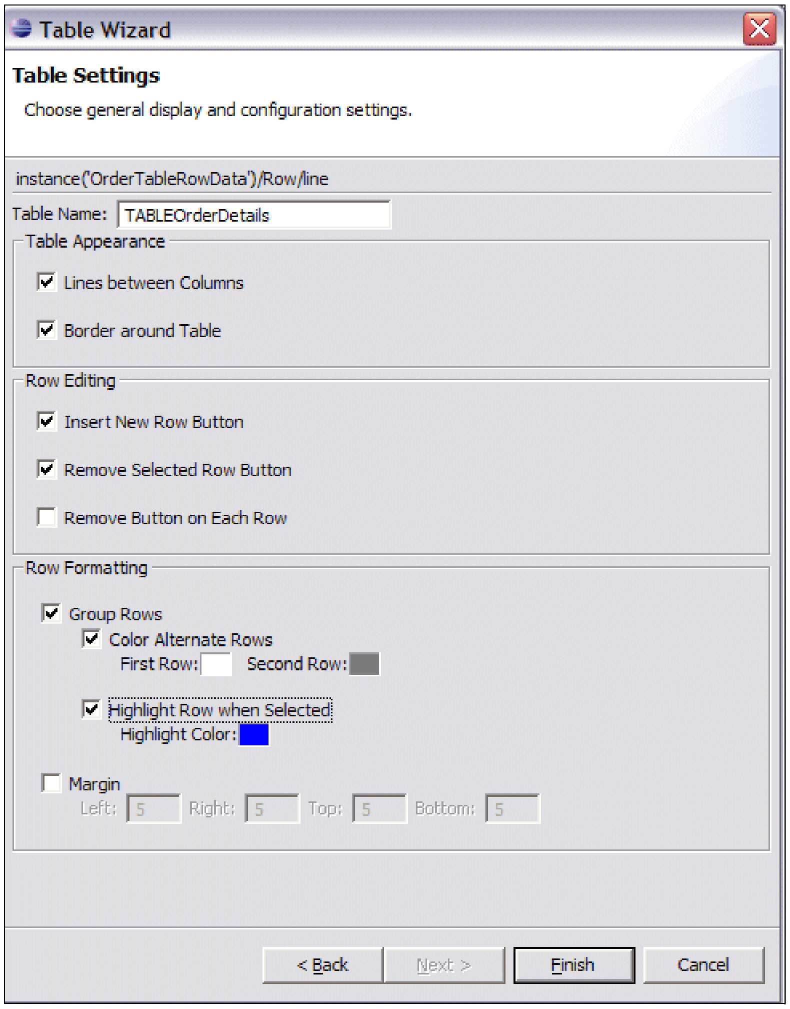
1. name
2. id
3. stock
4. amount
5. price
6. discount
7. line_total
8. subtotal

Now set the detail properties as shown in Table 5-1, and click **Next** when done.

Table 5-1 Detail properties

Element	Display as	Include header	Header	Width	Show border
name	Text (Read/Write)	Y	Item	100	Y
id	Text (Read/Write)	Y	Item number	100	Y
stock	Text (Read/Write)	Y	# in stock	100	Y
amount	Text (Read/Write)	Y	quantity	100	Y
price	Text (Read/Write)	Y	price	100	Y
discount	Text (Read/Write)	Y	discount	100	Y
line_total	Text (Read)	Y	total	100	Y
subtotal	Text (Read)	N	(n/a)	10	N

The next screen is the last step in the wizard. Provide a unique table name, and set the remaining properties as displayed in Figure 5-55. Click **Finish** when done.



instance('OrderTableRowData')/Row/line

Table Name: TABLEOrderDetails

Table Appearance
- [✓] Lines between Columns
- [✓] Border around Table

Row Editing
- [✓] Insert New Row Button
- [✓] Remove Selected Row Button
- [ ] Remove Button on Each Row

Row Formatting
- [✓] Group Rows
  - [✓] Color Alternate Rows
    First Row: ⬜ Second Row: ▨
  - [✓] Highlight Row when Selected
    Highlight Color: 🟦
- [ ] Margin
  Left: 5 Right: 5 Top: 5 Bottom: 5

Figure 5-55 Table Settings

A new table is added to the form. If you preview the form now you see that it is fully functional. You can add and remove rows, enter values for the fields, and the values stored in the data model (zero) are shown. However, it does not look anything like the template. In order to make it look like the original we have to add a header and format the labels for our columns.

Warning messages

You may notice in the Problems view that there are two warning messages, as shown in Figure 5-56.

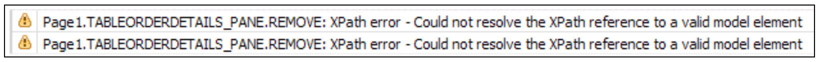

Page1.TABLEORDERDETAILS_PANE.REMOVE: XPath error - Could not resolve the XPath reference to a valid model element
Page1.TABLEORDERDETAILS_PANE.REMOVE: XPath error - Could not resolve the XPath reference to a valid model element

Figure 5-56 Warning messages

If you look closely you see that these warning messages are associated with the add/remove functions for our action buttons. These are XPath reference errors that are resolved at runtime when the references needed are generated. Do not be concerned by these warning messages.

Add table header

To add a table header to this table it is best if we insert it into the XForms pane with the sid TABLEORDERDETAILS_PANE. The easiest way to accomplish this insert is via the Outline view. In the Outline view, expand the item list until you locate the TABLEORDERDETAILS_PANE, and expand it. Then in the palette click the **Non XForms Label** item, and insert it as the first child element of the outline, as shown in Figure 5-57.

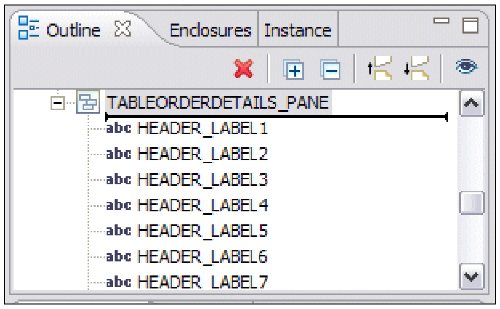


Figure 5-57 Insert label

If you insert it properly the new label item is the first item in the list, and appears as the topmost item on your canvas, as shown in Figure 5-58.

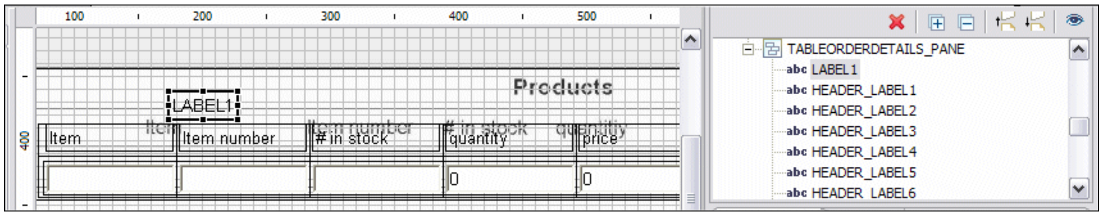


Figure 5-58 Label inserted in outline and on canvas in side pane

Pixel perfect

Generally speaking, the level of effort to reach *near pixel perfect* duplication of the original form varies. Often it depends on the business requirements of the form. For instance, if this form needs to be submitted to a government agency then the electronic version of the form may need to be an exact duplicate of the traditional paper-based form.

In the example used for this book, the benefits of advanced design functionality is a higher priority than exactly reproducing the layout of the original form. What we gain in functionality with the creation of a dynamic table far outweighs the loss of precision with lining up all of the columns to the template for the sales quotation form.

Format column headers

We are not going to align all of the column headers to the form template. The business requirements of this form do not justify the level of effort required. We do not completely abandon the template design. Instead, we format the fonts for the labels of the column headers. Use the same settings applied earlier to the field labels as were done in the prior sections of this chapter for the sales person and customer sections.

Modify buttons location and format

To allow the new table to fit within the page size selected we have to shorten the width. The easiest way to do this is to move the action buttons to the bottom of our table. We need to remove some of the existing relative alignment rules that place the buttons after the table, and apply new relative alignment rules to keep the buttons below the bottom-most row.

Align buttons

Remove the relative alignment rules defined for the Add row button. Then move the button to the bottom left of the table border, as shown in Figure 5-59.

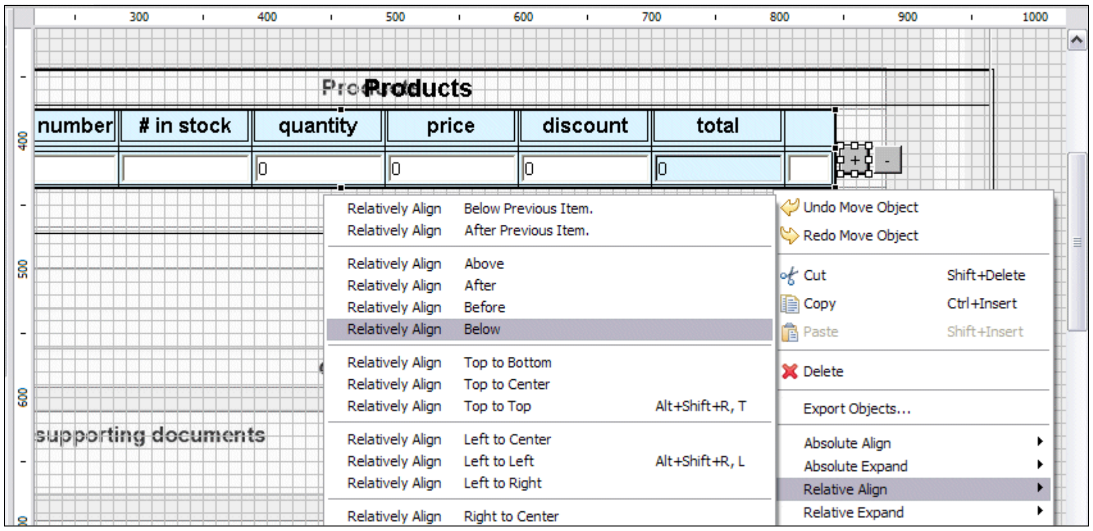


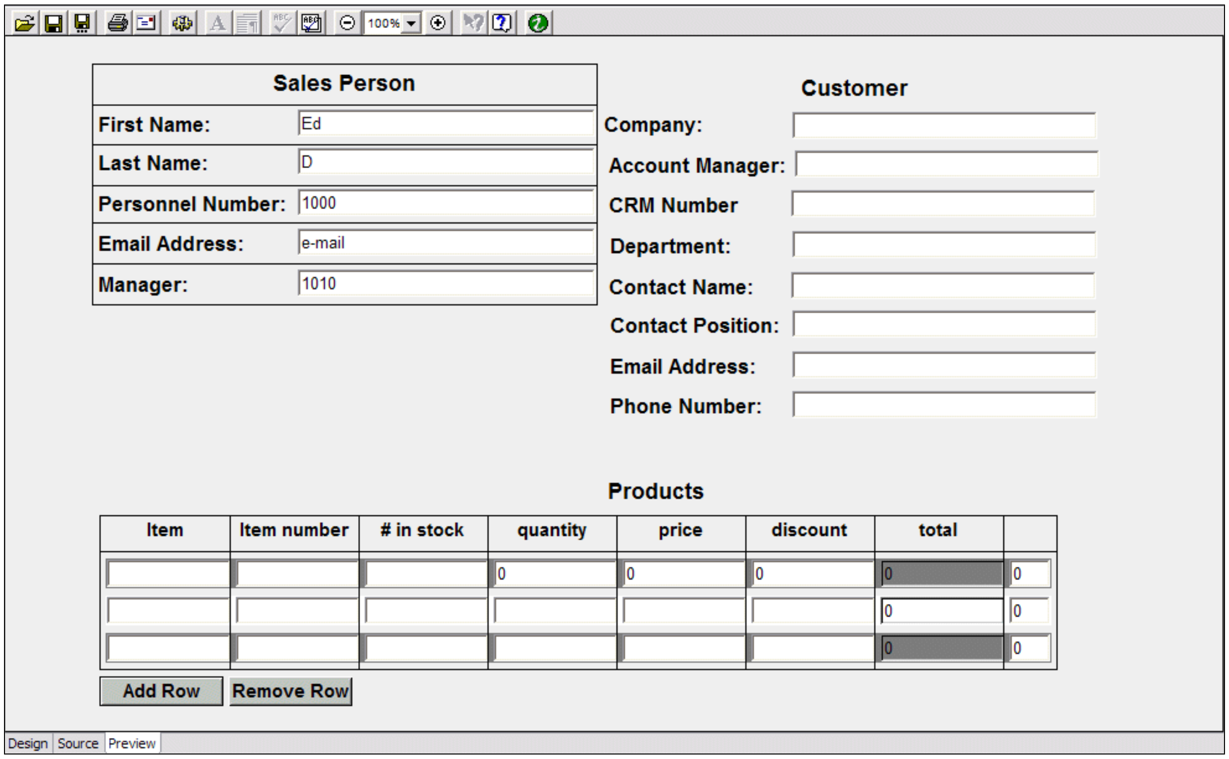
Figure 5-59 Relative align button below border of table

Relative aligning the Add row button below the border pane allows us to keep the form within the TABLEORDERSDETAIL_PANE and ensures that it remains below the bottom-most row, and because the Remove row button is relative aligned to remain after the Add row button, we do not have to modify its layout properties.

Format buttons

Change the value properties for both buttons. Change the Add row button value from the plus sign (+) to the text `Add Row`, remove the width property for this button under the itemlocation section, and change the font to 9 point Helvetica Bold. Change the Remove row button value from the minus sign (-) to the text `Remove Row`, remove the width property for this button, and change the font to match the Add row button.

The last step is to make both buttons the same size. Use absolute expand to set the Add Row button to the same size as the Remove Row button. Preview the form. When finished the form should look like the one shown in Figure 5-60. Test the new settings by adding and removing a few rows. Make sure that the Add and Remove buttons are moved down or up accordingly.



Sales Person	
First Name:	Ed
Last Name:	D
Personnel Number:	1000
Email Address:	e-mail
Manager:	1010

Customer

Company:	
Account Manager:	
CRM Number	
Department:	
Contact Name:	
Contact Position:	
Email Address:	
Phone Number:	

Products

Item	Item number	# in stock	quantity	price	discount	total	
			0	0	0	0	0
						0	0
						0	0

Figure 5-60 Preview form

5.6.5 Add advanced items to table

Earlier in this section we discussed options to enhance the form. One way to do this is to use list items to restrict user input. The table has two primary candidates for lists: item and discount.

Note: Ultimately these instances are populated by a call to a backend database. Making modifications now does not hinder those later efforts because once the XForms call is made it overwrites the existing data.

Create item list

We use the Popup (Select1) item to list our data elements and link them to the InventoryItems instance, as shown in Example 5-10.

Example 5-10 InventoryItems instance

```
<!-- this instance provides the choices list for the items -->

<xforms:instance id="InventoryItems" xmlns="">
   <InventoryItems>
      <InventoryItem></InventoryItem>
   </InventoryItems>
```

```
</xforms:instance>
```

There is only one child element in our instance. To show a list we need more than one. To modify the instance, open the Source editor by clicking the **Source** tab in the lower left-hand corner of the Designer. Locate the instance in the source code.

Tip: To locate specific instances in the source code you can use the Outline view, or conduct a search using Ctrl+F and entering a unique string.

Add child elements to instance

Modify the instance to include a value for the <InventoryItem>. We enter `Nut`. Create another child element in the InventoryItems parent node using the same <InventoryItem> tag, and enter a second value. We enter `Bolt`. Repeat the last step to add a third value, such as `Widget`. Example 5-11 shows the changes. Save your changes to check for errors, and return to the Design canvas when finished.

Example 5-11 Multiple inventory items

```
<!-- this instance provides the choices list for the items -->

<xforms:instance id="InventoryItems" xmlns="">
   <InventoryItems>
      <InventoryItem>Nut</InventoryItem>
      <InventoryItem>Bolt</InventoryItem>
      <InventoryItem>Widget</InventoryItem>
   </InventoryItems>
</xforms:instance>
```

Add popup item to the table

Now that we have updated the instance with three values, when we add our popup item to the form and bind it to our instance it shows three items in the list to select from. Begin by adding the item to the table using the steps outlined below. Since this is a dynamic table we have to be certain that we account for any relative positioning or sizing properties that may exist.

1. Select the **Popup (Select1)** item from the palette (see Figure 5-61).

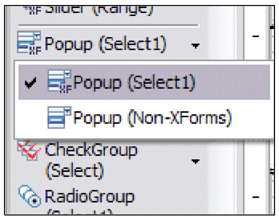


Figure 5-61 Popup (Select1) item

2. Using the Outline view, place the popup item inside the Row_Group pane as the first item in the list. It must be before the other field items in the build order so that we can maintain the relative positioning rules generated by the wizard, as shown in Figure 5-62.

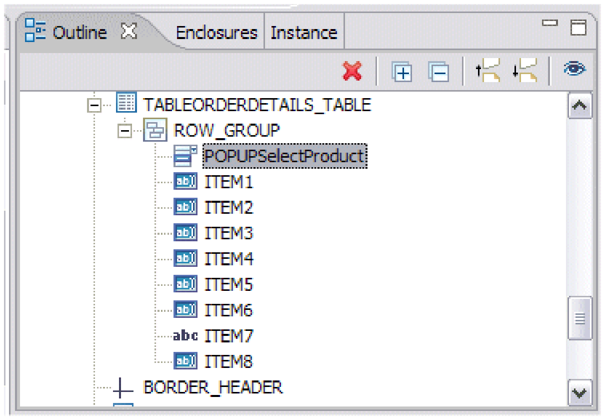


Figure 5-62 Place popup before item1

3. Before we begin setting any relative alignment rules we must define a couple of general properties for the item.
   a. In the Properties view, click within the sid value field and change it to POPUPSelectProduct, and press Enter to apply our changes.
   b. Click within the label value field, type `Select your Product` for the label, and then press Enter.

   Note: Always define the sid for an item before setting any relative position or sizing values. Changing the sid later may break your relative positioning and sizing settings.

4. Delete the Item1 field in the Row_Group pane from the form (the popup item is going to replace it).
5. Use relative alignment to position the POPUPSelecctProduct item left to left with the item column header - HEADER_LABEL1 item.
6. Absolute expand the HEADER_LABEL1 width to equal that of the POPUPSelecctProduct item.

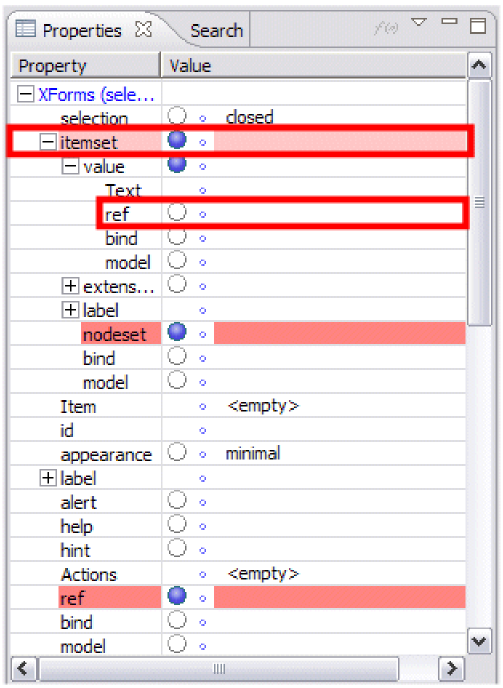
That completes the placement of our new item. Now we need to bind it to our instance.

Define instance bind

We define our bind properties in the Properties view for the POPUPSelecctProduct item. Notice that there are a number of properties and sections in this section that have been highlighted in red. This is an indication that the XForms binds have not been defined and should be expected. We resolve these issues in the following steps:

1. Since we are connecting the list to a data node set used for the table, we must make sure the default value of *on* is enabled for the itemset → value property.
   a. Expand **XForms (select1)** and **itemset**.
   b. Make sure that there is a blue circle for the value under itemset. If it is not there, add it by clicking the empty circle.

c. Enter a period for the ref value or remove the blue circle to disable the ref value, as shown in Figure 5-63.

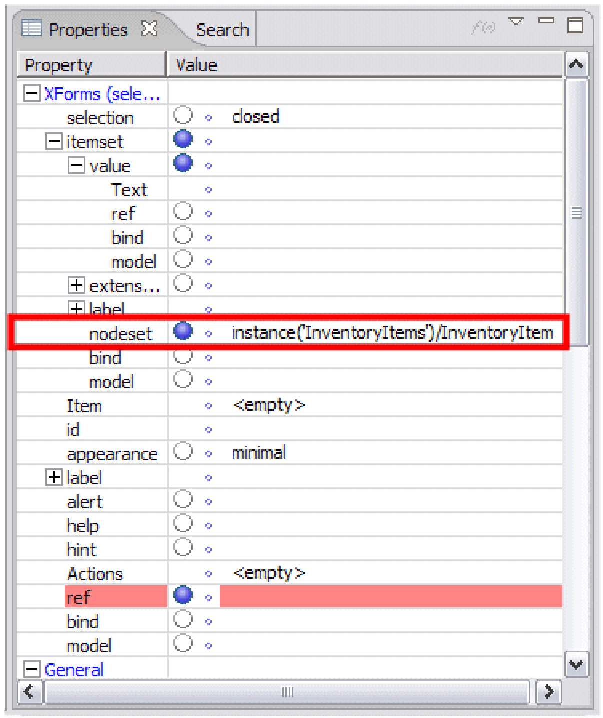


Properties | Search

Property	Value
XForms (sele…	
selection	○ closed
itemset	●
value	●
Text	
ref	○
bind	○
model	○
extens…	○
label	
nodeset	●
bind	○
model	○
Item	<empty>
id	
appearance	○ minimal
label	
alert	○
help	○
hint	○
Actions	<empty>
ref	●
bind	○
model	○

Figure 5-63 itemset enabled

2. While still in the itemset section, click the **nodeset** value field. Type the XPath of the node that you want to bind the list to: `instance('InventoryItems')/InventoryItem` (see Figure 5-64).



Properties | Search

Property	Value
XForms (sele…	
selection	○ closed
itemset	●
value	●
Text	
ref	○
bind	○
model	○
extens…	○
label	
nodeset	● instance('InventoryItems')/InventoryItem
bind	○
model	○
Item	<empty>
id	
appearance	○ minimal
label	
alert	○
help	○
hint	○
Actions	<empty>
ref	●
bind	○
model	○
General	

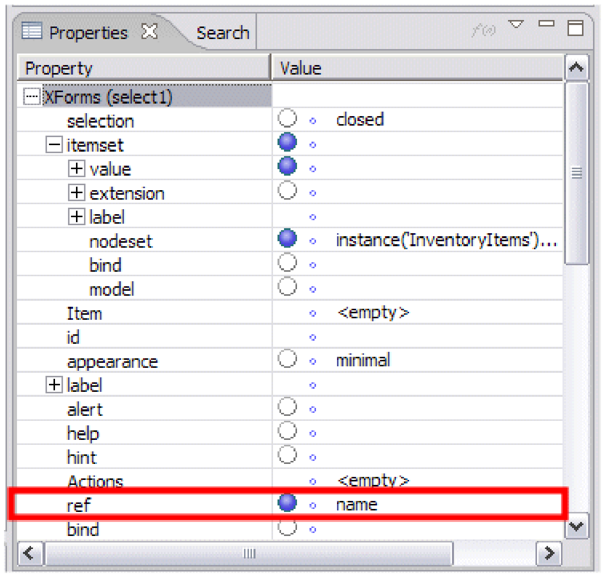
Figure 5-64 Set XPath reference for nodeset property

3. You must now set the property that stores the user's choice form the list. This popup list is used in place of another field in the table, but we still want the value selected to be stored in the original XForms Model element. We are replacing the name element in the OrderTableRowData instance. Normally the XPath reference would look like that shown in Example 5-12.

Example 5-12   XPath reference

```
instance('OrderTableRowData')/Row/line/name
```

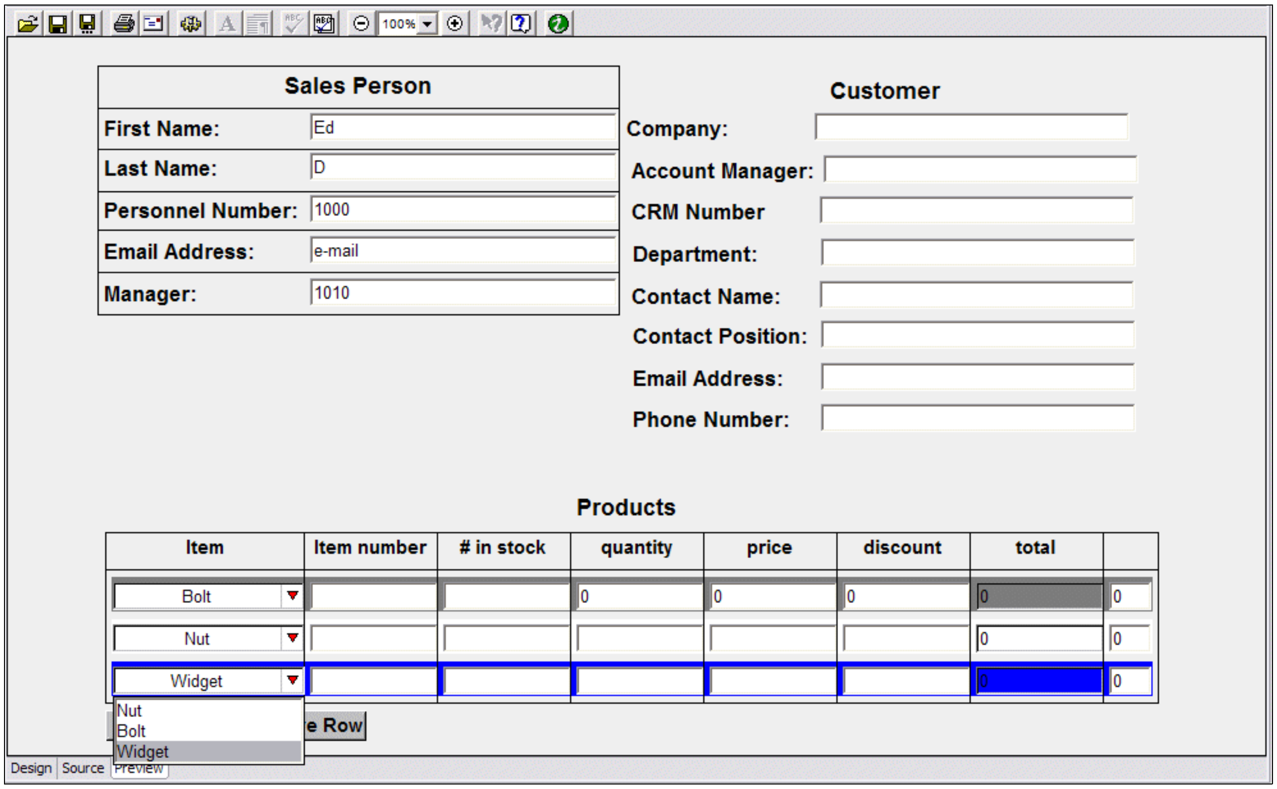
Since this is part of a dynamic table, we have to use a relative path to ensure that the value selected in one row does not change the value shown in all of the rows. The relative path for this reference is *name*, as shown in Figure 5-65.



Property	Value
XForms (select1)	
selection	closed
itemset	
value	
extension	
label	
nodeset	instance('InventoryItems')...
bind	
model	
Item	<empty>
id	
appearance	minimal
label	
alert	
help	
hint	
Actions	<empty>
ref	name
bind	

Figure 5-65   XForms reference

Preview the form again. Notice that the popup list has all three items that we identified in the instance. Select one and add a new row. Select another. Notice that it remains unique to each row, as shown in Figure 5-66.



Sales Person	
First Name:	Ed
Last Name:	D
Personnel Number:	1000
Email Address:	e-mail
Manager:	1010

Customer	
Company:	
Account Manager:	
CRM Number	
Department:	
Contact Name:	
Contact Position:	
Email Address:	
Phone Number:	

Products

Item	Item number	# in stock	quantity	price	discount	total	
Bolt			0	0	0	0	0
Nut						0	0
Widget						0	0

Nut
Bolt
Widget

Figure 5-66 Working popup list

Create discount list

We use Popup (Select1) item to list our data elements and link them to an existing data model, Discount_Values. To create the discount list we use many of the same steps and settings as when we created the Item list.

We have already explored the details of the Discount_Values instance to be used to populate the values of our list. Example 5-13 shows us the instance itself. For details on this instance refer to 5.4.4, "Creating the instance" on page 193.

Example 5-13 Discount_Values

```
<!-- Discount values between 10 and 30 percent - select percentage, display float
integer -->
   <xforms:instance id="Discount_Values" xmlns="">
      <Discounts>
         <Values>
            <percent attribute="0.1">10%</percent>
            <percent attribute="0.2">20%</percent>
            <percent attribute="0.3">30%</percent>
         </Values>
      </Discounts>
   </xforms:instance>
```

One thing that is evidently different about this instance is the declaration of an attribute. We display the percent values to the end user as choices, but submit the real number value to the XForms Model once a user makes a choice.

Add popup item to table

Since the values for are instance are already defined, when we add our popup item to the form and bind it to our instance it shows four items in the list to select from. Begin by adding the item to the table using the steps outlined below. Since this is a dynamic table we have to be certain that we account for any relative positioning or sizing properties that may exist.

1. Select the **Popup (Select1)** item from the palette (see Figure 5-67).

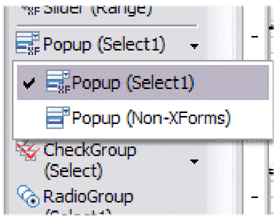


Figure 5-67 Popup (Select1) item

2. Using the Outline view, place the popup item inside the Row_Group pane as the first item in the list. It must be before the other field items in the build order so that we can maintain the relative positioning rules generated by the wizard, as shown in Figure 5-68.

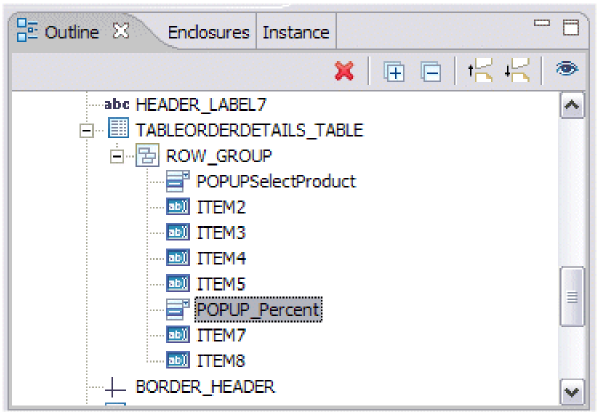


Figure 5-68 Place popup before item5

3. Before setting relative alignment rules we must first define a couple of general properties for the item.
   a. In the Properties view, click within the sid value field and change it to `POPUP_Percent` and press Enter to apply our changes.
   b. Click within the label value field, type zero (`0`) for the label, and press Enter.

> **Note:** Always define the sid for an item before setting any relative position or sizing values. Changing the sid later may break your relative positioning and sizing settings.

4. Delete the Item6 field in the Row_Group pane from the form. (The popup item is going to replace it.)

5. Use a modified relative alignment to position the POPUP_Percent item after Item5, and to place Item7 after POPUP_Percent.

   Note: When creating this form we encountered an issue when we modified the wizard table to include a list item.

   Although the layout appeared correct in the designer, when previewed, the alignment for the item following our list item was off.

   To correct the issue, we used relative alignment to reposition the item that followed the list item pointing directly to the popup field like this: <after>POPUP1</after> in place of the standard positioning as <after compute="itemprevious"></after> created by the designer.

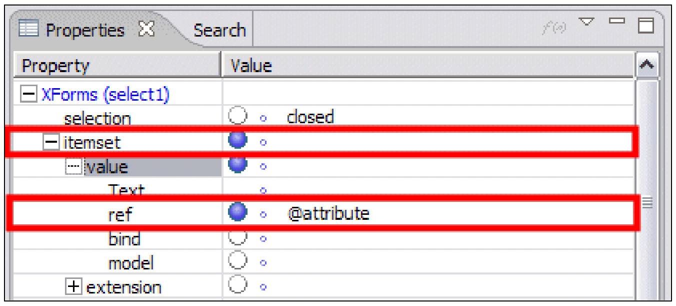
6. Absolute expand the popup width to equal that of the width of the discount column header - HEADER_LABEL6 item.

That completes the placement of our new item. Now we need to bind it to our instance.

Define instance bind

We define our bind properties in the Properties view for the POPUP_Percent item. Notice that there are a number of properties and selections in this section that have been highlighted in red. This is an indication that the XForms binds have not been defined and should be expected. We resolve these issues in the following steps:

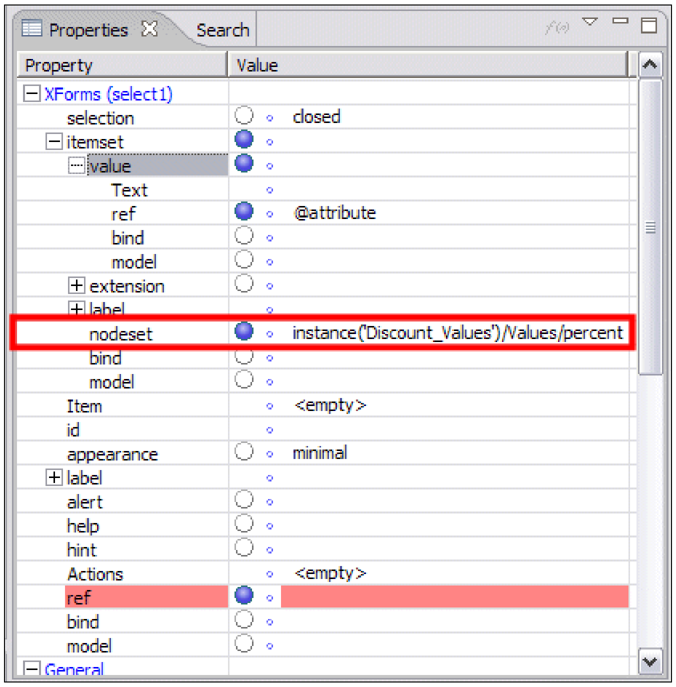
1. Since we are connecting the list to a data node set used for the table, you must make sure that the default value of *on* is enabled for the itemset → value property.
   a. Expand **XForms (select1)** and **itemset**.
   b. Make sure that there is a blue circle for the value under itemset. If it is not there, add it by clicking the empty circle.
   c. Enter `@attribute` for the ref value, as shown in Figure 5-69.



Property	Value
XForms (select1)	
selection	○ closed
itemset	●
value	●
Text	
ref	● @attribute
bind	○
model	○
extension	○

Figure 5-69 itemset enabled

2. While still in the itemset section, click the **nodeset** value field. Type the XPath of the node that you want to bind the list to: `instance('Discount_Values')/Values/percent` (see Figure 5-70).



Property	Value
XForms (select1)	
selection	closed
itemset	
value	
Text	
ref	@attribute
bind	
model	
extension	
label	
nodeset	instance('Discount_Values')/Values/percent
bind	
model	
Item	<empty>
id	
appearance	minimal
label	
alert	
help	
hint	
Actions	<empty>
ref	
bind	
model	
General	

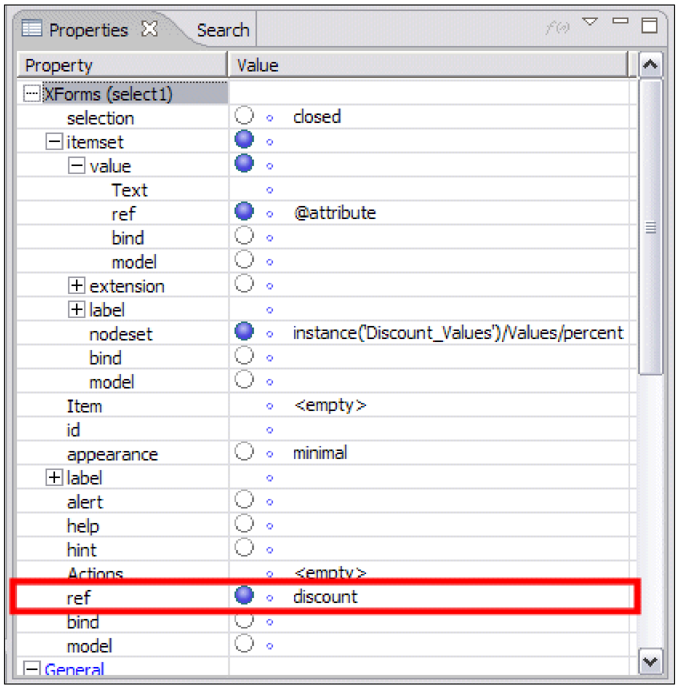
Figure 5-70 Set XPath reference for nodeset property

3. You must now set the property that stores the user's choice form the list. This popup list is used in place of another field in the table, but we still want the value selected to be stored in the original XForms Model element. We are replacing the discount element in the OrderTableRowData instance. Normally the XPath reference would look like that shown in Example 5-14.

Example 5-14 XPath reference

```
instance('OrderTableRowData')/Row/line/discount
```

However, since this is part of a dynamic table, we have to use a relative path to ensure that the value selected in one row does not change the value shown in all of the rows. The relative path for this reference is discount, as shown in Figure 5-71.

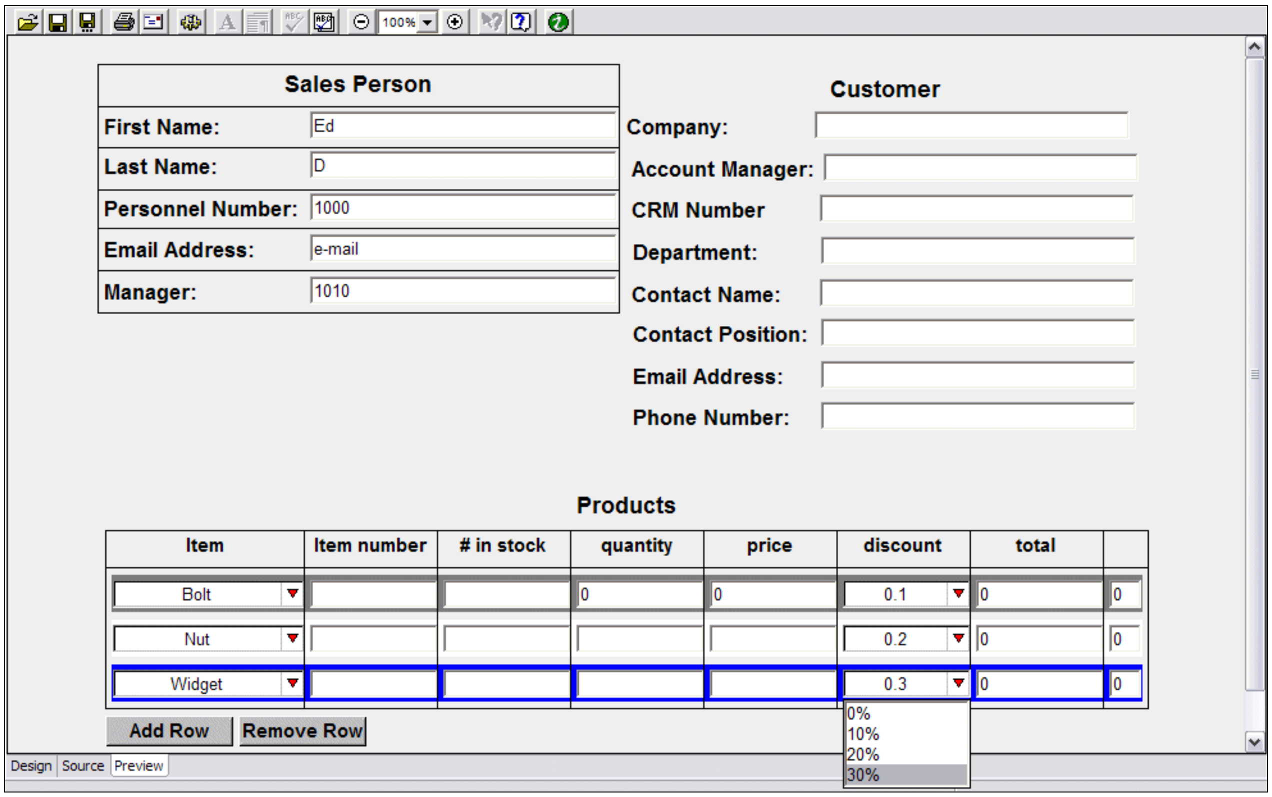


Properties | Search

Property	Value
XForms (select1)	
selection	○ closed
itemset	●
value	●
Text	
ref	● @attribute
bind	○
model	○
extension	○
label	
nodeset	● instance('Discount_Values')/Values/percent
bind	○
model	○
Item	<empty>
id	
appearance	○ minimal
label	
alert	○
help	○
hint	○
Actions	<empty>
ref	● discount
bind	○
model	○
General	

Figure 5-71 XForms reference

Preview the form again. Notice that the popup list has all three items we identified in the instance. Select one and add a new row. Select another. Notice that it remains unique to each row, as shown in Figure 5-72.



Sales Person	
First Name:	Ed
Last Name:	D
Personnel Number:	1000
Email Address:	e-mail
Manager:	1010

Customer	
Company:	
Account Manager:	
CRM Number	
Department:	
Contact Name:	
Contact Position:	
Email Address:	
Phone Number:	

Products

Item	Item number	# in stock	quantity	price	discount	total	
Bolt			0	0	0.1	0	0
Nut					0.2	0	0
Widget					0.3	0	0

Figure 5-72 Working popup list

5.6.6 Add XForms Model binds

We use XForms Model binds to perform the calculations needed in our table. We need to define five binds for our form:

- A line subtotal equal to price times the quantity ordered
- Cost savings total of the discounts given
- Price total equal to the sum of the subtotal of each line
- Line Total equal to the price times the quantity ordered less the discount
- Grand total equal to the sum of the total of each line

In this section we discuss the following topics:

- XForms Model binds and XForms bindings
- Model bind properties
- Line subtotal
- Line total
- Add new pane, fields, and a label to the table
- Price total
- Cost savings
- Grand total

XForms Model binds and XForms bindings

There are two types of binds that can be used when creating forms, and they are very different and should not be confused:

- XForms binding: Binding is a link between the data layer and the form's user interface (UI) layer. Binding lets you:
  - Synchronize the data model with the form presentation layer. If the value of one changes, the other linked elements are updated to reflect the changes.
  - Place constraints, calculations, validations, and limitations on what data the user enters.

  You can bind UI controls to the data instance using one of two methods:

  - ref or nodeset — creates a direct link between a UI element and a data element in the XForms instance using an XPath reference
  - bind — creates an indirect link between a UI element and a data element in the XForms data instance using a model bind
- XForms Model bind: Once you have created a data instance, you can set the properties of its nodes. This is done using a model bind. You use a model bind to perform special calculations or place limitations on user data. For example, you might want to perform a calculation on a certain node or ensure that supplying certain data is mandatory. Each XForms Model can have one or more associated model binds.

Model bind properties

Every model bind contains one or more model item properties. These properties describe the way the model bind modifies its associated node. These modifications include determining the value of nodes, their validity, or relevancy.

Model bind properties let you:

- Name the model bind (optional).
- Determine the node or nodeset that is affected by the model bind (required).
- Describe the way the model bind effects the element (required).

Table 5-2 describes the two general properties for model binds.

Table 5-2 General XForms Model bind properties

Property	Description
id	Lets you give a globally unique name to your model bind. This property is optional, but necessary if you want to refer to the model bind elsewhere in your form.
nodeset	Identifies which element is affected by the model bind. It must refer to a node in a data instance. Every model bind is associated with a nodeset, either directly, or in the case of nested binds, through inheritance from a parent bind.

Every model bind contains one or more model item properties like those listed in Table 5-3. These properties describe the way the model bind modifies its associated node. These modifications include determining the value of nodes, their validity, or relevancy.

Table 5-3 Model item properties

Property	Description
Calculate	The calculate property defines a calculation that determines the value of the associated node. It lets you add mathematical formulas and computed logic to your data instance. The essential elements of the calculation are XPath expressions combined with normal mathematical expressions.
Constraint	The constraint property determines whether an associated node is valid. For example, if you wanted to ensure that a field contains a number higher than 0 but less than 10, you would use constraint to prevent the form from accepting a value that was outside of that range. You can use both relational and logical operators. Relational operators are character sets that describe how one thing relates to another. For example, the greater than and less than signs are relational operators. Logical operators let you create more complex computes with logical or and logical and.
Readonly	The readonly property determines whether the data in the associated node can be changed. Readonly accepts any XPath expression as its setting, but the result is always converted to either true() or false(). The default value of readonly is false(), as most nodes will accept input from the user. However, if the model bind includes a calculate property, the node automatically has a readonly of true(), as the value of the node will be based on a calculation, and not directly on input from the user. Furthermore, if a node is set to readonly, then all of its child nodes automatically inherit the readonly setting.
Relevant	The relevant property determines whether a node is displayed to the user or included in XForms submissions.
Required	The required property determines whether a node requires mandatory user input.
Type	The type property sets the data node to be a particular data type.

We use model binds to perform our table calculations.

Line subtotal

The first value we need to set is the line subtotal since it provides us with the value necessary for our other calculations. To create the line subtotal model bind complete the following steps:

1. In the XForms view, select the **model:FormModel** to add the model bind.

2. Right-click and select **Create Bind**, as shown in Figure 5-73.

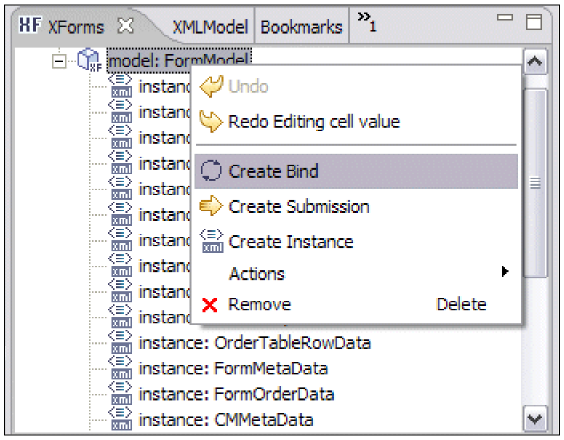


Figure 5-73 Create model bind

3. In the Properties view, expand the **General** section.
4. Type a descriptive, unique bind name in the id value, `line_subtotal`. The id property is optional, but necessary if you want to refer to the bind elsewhere in your form.

   Note: IDs are only allowed on parent binds. They are not supported on binds nested inside another bind.

5. Expand the Model Item Properties section and in the nodeset property value, type the XPath location of the node set whose elements you want to bind. We want to set the subtotal field on our table. So we use the same reference:

   “`instance('OrderTableRowData')/Row/line/subtotal`”

   Note: The nodeset value identifies which element is affected by the model bind and must refer to a node in a data instance. Every model bind is associated with a node set, either directly, or in the case of nested binds, through inheritance from a parent bind.

6. Now we have to define our calculation. We can use either a full path or a relative path in our calculations for the model binds. The calculation values are shown in Table 5-4.

   Table 5-4 Calculation values

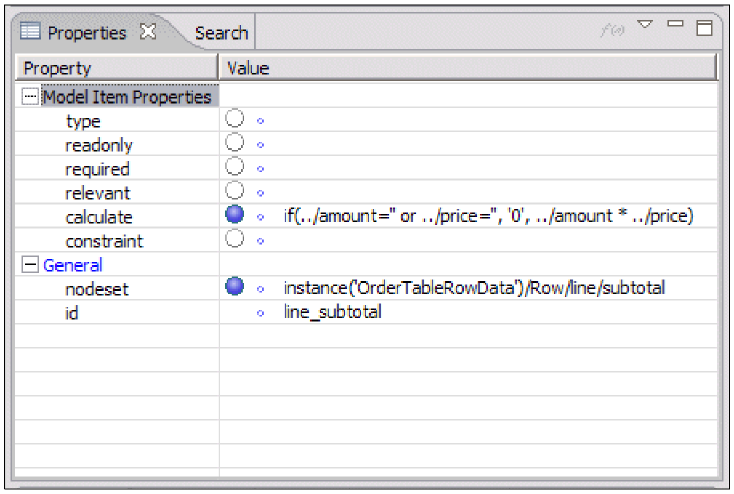
Value	Full path	Relative path
quantity	instance('OrderTableRowData')/Row/line/amount	../amount
price	instance('OrderTableRowData')/Row/line/price	../price

   To prevent a miscalculation when the form first loads, we check to be sure that the quantity of items and price are not null, and if so we set those values to zero. Otherwise we calculate the quantity of items times the price for each item. We know from prior sections that the resulting calculation is as follows:

   “`if(../amount='' or ../price='', '0', ../amount * ../price)`”

   Enter the above equation in the calculate field of the Model Bind Properties view.

When finished, the properties should appear as shown in Figure 5-74.



Properties | Search

Property	Value
Model Item Properties	
type	○
readonly	○
required	○
relevant	○
calculate	● if(../amount=" or ../price=", '0', ../amount * ../price)
constraint	○
General	
nodeset	● instance('OrderTableRowData')/Row/line/subtotal
id	line_subtotal

Figure 5-74 line_subtotal model bind properties

Preview your form to test your bind. Notice that when you provide values for the quantity column and the price column, the last field on the row is automatically calculated and the value displayed.

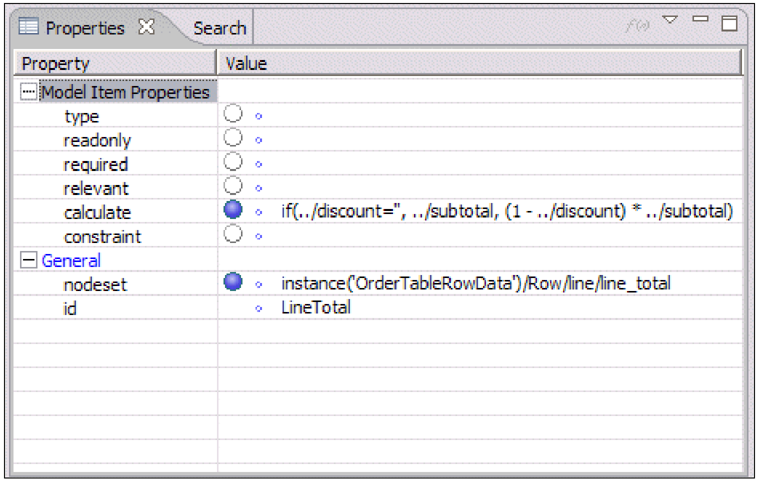
Line total

The line total model bind is not much different from the previous bind, except this time we include the discounted value. Add a new model bind to our XForms Model. Use the properties shown in Table 5-5 to complete the model bind definition.

Table 5-5 Line total properties

Property	Value	Description
id	LineTotal	Unique name.
nodeset	instance('OrderTableRowData')/Row/line/line_total	The line total (second to last column).
calculate	if(../discount='', ../subtotal, (1 - ../discount) * ../subtotal)	If the discount value is nil, then set the line total equal to the subtotal. Otherwise, set the line total equal to the subtotal less the discount.

When finished, the properties should look like those shown in Figure 5-75.



Properties | Search

Property		Value
Model Item Properties		
type	○	
readonly	○	
required	○	
relevant	○	
calculate	●	if(../discount='', ../subtotal, (1 - ../discount) * ../subtotal)
constraint	○	
General		
nodeset	●	instance('OrderTableRowData')/Row/line/line_total
id		LineTotal

Figure 5-75 Line total model bind

If you preview the form and enter values for quantity, price, and discount, both the line subtotal and line total fields are automatically populated.

Add new pane, fields, and a label to the table

We need to add three new fields to display the values calculated for the end users:

- Price Total
- Savings Total
- Grand Total

These new items are placed inside the Table pane, but below the dynamic rows so the new buttons themselves have to move up or down accordingly. An effective way to accomplish our goal is to place our new buttons, along with the existing buttons, into an XForms pane. Using a pane to contain our items reduces the number of relative alignment rules we need to generate and maintain, as well as provides us with a means to differentiate this area of the form.

Add pane

Follow the steps below to add a new pane to our table:

1. Select the **Pane (Group)** item from the palette.
2. Using the Outline view, insert the item as the last item in the list for the TABLEORDERDETAILS_PANE.
3. Leave the pane sid equal to PANE1.
4. Again, using the Outline view, move the Add button and Remove button to the new pane.
5. Use relative alignment to place PANE1 below TABLEORDERDETAILS_TABLE.
6. Use relative expand to resize PANE1 right to right with TABLEORDERDETAILS_TABLE.
7. Preview your form to test the new configuration.

Add fields

Follow the steps below to add three more fields to the form:

1. Select the **Field (Input)** item form the form.
2. Place three of those input fields inside PANE1: Field1, Field2, and Field3.

3. Place the first field in the right-most corner of the table, the second field before it, and the third before the second.
4. Make sure that they follow after the Remove button in the build order shown in the outline.
5. Set the properties for Field1, as shown in Table 5-6.

Table 5-6 Field1 properties

Property	Value	Description
General → sid	GRANDTOTAL	Unique identifier.
Appearance → justify	right	Right justify contents of field.
General → item location → width	100	Equal to the other items in the table.
General → item location → alignt2t	REMOVE (*button item*)	Use relative alignment to align the top of this field item to the top of the Remove button.
General → itemlocation → x	676	Determined by using absolute positioning to line up the right to right of this item with the Item7 item.
General → itemlocation → y	362	Determined by using absolute positioning to line up the right to right of this item with the Item7 item.
General → readonly	on	Since this field will be calculated it should be read only.
Format → datatype	currency	Set value to a dollar amount.
XForms → ref	instance('FormOrderData')/Amount	XPath reference to element Cost, of the FormOrderData instance.

6. Set the properties for Field2, as shown in Table 5-7.

Table 5-7 Field2 properties

Property	Value	Description
General → sid	Savings	Unique Identifier.
Appearance → justify	right	Right justify contents of field.
General → item location → width	100	Equal to the other items in the table.
General → readonly	on	Since this field will be calculated it should be read only.
General → itemlocation → before	Savings	Item will always remain before the savings field value.
Format → datatype	currency	Set value to a dollar amount.
XForms → ref	instance('FormOrderData')/Discount	XPath reference to element Cost, of the FormOrderData instance.

7. Set the properties for Field3, as shown in Table 5-8.

Table 5-8 Field3 properties

Property	Value	Description
General → sid	Cost	Unique Identifier.
Appearance → justify	right	Right justify contents of field.
General → itemlocation → width	100	Equal to the other items in the table.
General → readonly	on	Since this field will be calculated it should be read only.
General → itemlocation → before	Savings	Item will always remain before the savings field value.
Format → datatype	currency	Set value to a dollar amount.
XForms → ref	instance('FormOrderData')/Cost	XPath reference to element Cost, of the FormOrderData instance.

Add label

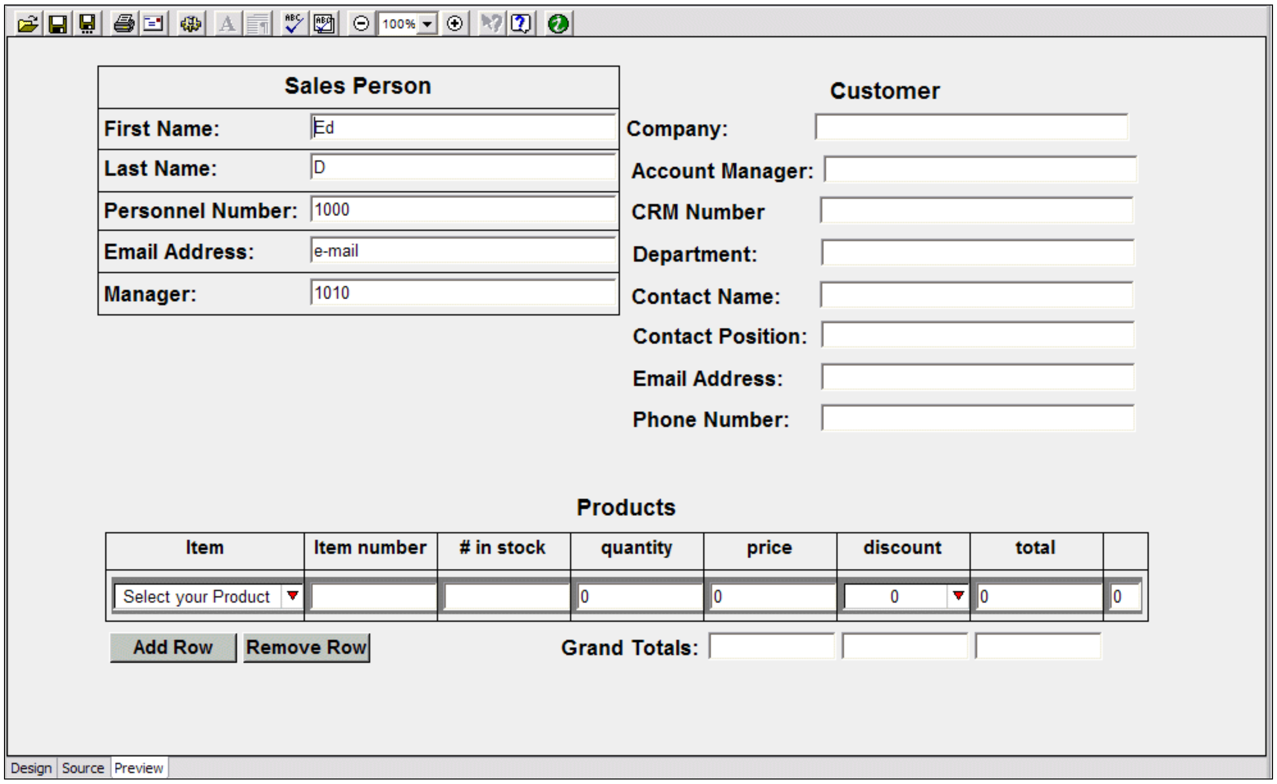
Add a non-XForms label to the form using these steps:

1. Select **label (Non-XForms)** from your palette.
2. Place the item inside PANE1.
3. Make sure that it is after the Cost field item in the build order.
4. Use the properties shown in Table 5-9 to complete the item properties.

Table 5-9 Label properties

Property	Value	Description
sid	GRANDTOTAL_LABEL1	Unique identifier.
value	Grand Totals:	Visible label value.
General → itemlocation → before	Cost	Use relative alignment to place the label before the first item on the left - Cost field item.
Appearance → fontinfo	10 point, Helvetica, Bold	Font style to be displayed to end user.
Appearance → justify	left	Left justify the label value on the form.

When finished, preview the form. It should look like that shown in Figure 5-76.



Sales Person	
First Name:	Ed
Last Name:	D
Personnel Number:	1000
Email Address:	e-mail
Manager:	1010

Customer	
Company:	
Account Manager:	
CRM Number	
Department:	
Contact Name:	
Contact Position:	
Email Address:	
Phone Number:	

Products

Item	Item number	# in stock	quantity	price	discount	total	
Select your Product			0	0	0	0	0

Figure 5-76 Form with new items added to dynamic table

Price total

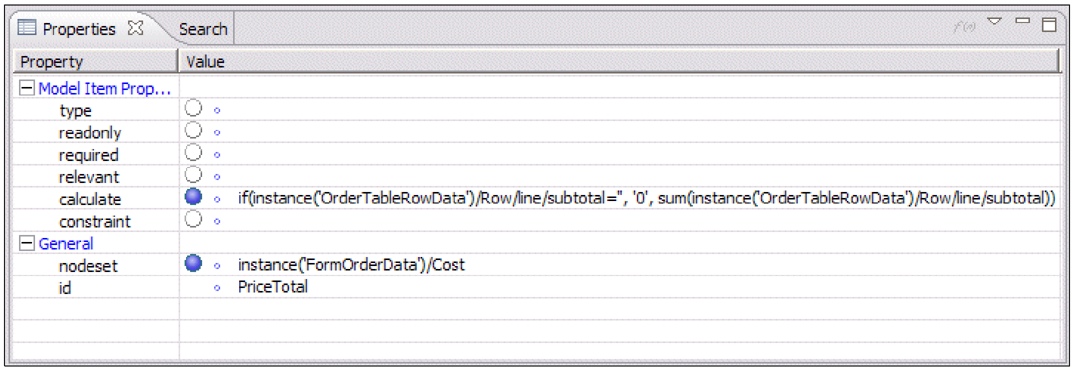
The price total is the first of three binds that use a function. You can use any of the mathematical functions available in IBM Workplace Forms in a calculation for a model bind.

Define a new bind using the properties shown in Table 5-10.

Table 5-10 Price total properties

Property	Value	Description
id	PriceTotal	Unique name.
nodeset	instance('FormOrderData')/Cost	Update the form order information to show total cost before discount.
calculate	if(instance('OrderTableRowData')/Row/line/subtotal='', '0', sum(instance('OrderTableRowData')/Row/line/subtotal))	If the subtotal value is nil, then set the subtotal equal to zero (0). Otherwise, set the price total equal to the sum of all subtotal values for every row.

When finished your properties should look like those shown in Figure 5-77.



Property	Value
Model Item Prop...	
type	
readonly	
required	
relevant	
calculate	if(instance('OrderTableRowData')/Row/line/subtotal='', '0', sum(instance('OrderTableRowData')/Row/line/subtotal))
constraint	
General	
nodeset	instance('FormOrderData')/Cost
id	PriceTotal

Figure 5-77 Price total model bind

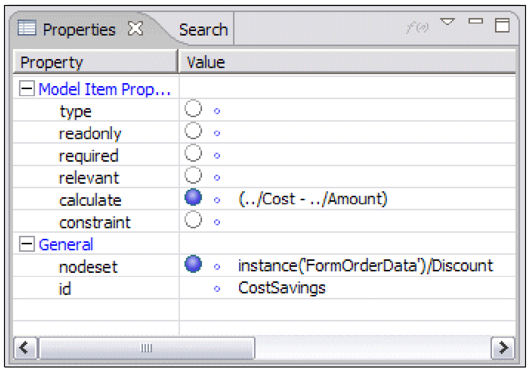
Cost savings

The cost savings calculation is determined by the total cost minus the total amount charged to a customer. The properties for this bind are shown in Table 5-11.

Table 5-11 Cost savings properties

Property	Value	Description
id	CostSavings	Unique name.
nodeset	instance('FormOrderData')/Discou nt	Set the total discount value in the FormOrderData instance.
calculate	(../Cost - ../Amount)	Equal to the total cost less the amount actually charged.

When finished your properties should look like those shown in Figure 5-78.



Property	Value
Model Item Prop...	
type	
readonly	
required	
relevant	
calculate	(../Cost - ../Amount)
constraint	
General	
nodeset	instance('FormOrderData')/Discount
id	CostSavings

Figure 5-78 Cost savings model bind

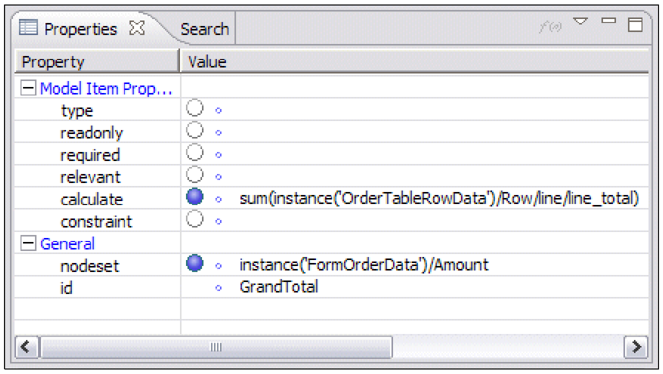
Grand total

This bind sets the sum of all of the line total totals and shows the grand total amount to be charged to the customer. Table 5-12 shows the properties that need to be defined.

Table 5-12 Grand total properties

Property	Value	Description
id	GrandTotal	Unique name.
nodeset	instance('FormOrderData')/Amount	Set the amount element of the FormOrderData instance.
calculate	sum(instance('OrderTableRowData')/Row/line/line_total)	Sum of all the line total totals.

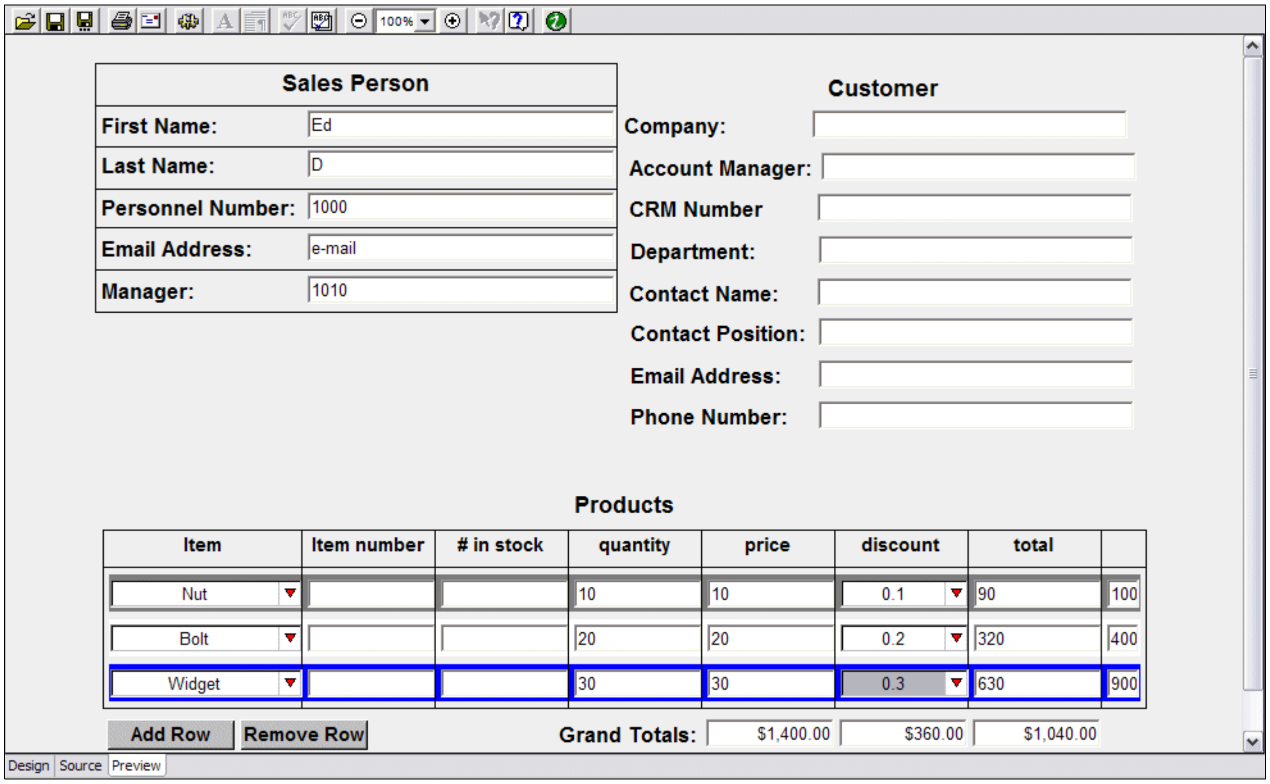
When finished your properties should look like those shown in Figure 5-75 on page 254.



Property	Value
Model Item Prop...	
type	
readonly	
required	
relevant	
calculate	sum(instance('OrderTableRowData')/Row/line/line_total)
constraint	
General	
nodeset	instance('FormOrderData')/Amount
id	GrandTotal

Figure 5-79 Line total model bind

This completes the last model bind that we need to define. When finished preview the form to see the results (see Figure 5-80). Notice that the calculations are automatically applied to the values entered into the field, preventing end users from making simple mathematical errors.



Sales Person

First Name:	Ed
Last Name:	D
Personnel Number:	1000
Email Address:	e-mail
Manager:	1010

Customer

Company:	
Account Manager:	
CRM Number	
Department:	
Contact Name:	
Contact Position:	
Email Address:	
Phone Number:	

Products

Item	Item number	# in stock	quantity	price	discount	total	
Nut			10	10	0.1	90	100
Bolt			20	20	0.2	320	400
Widget			30	30	0.3	630	900

Grand Totals: $1,400.00 $360.00 $1,040.00

Figure 5-80 Fully functional model binds in the table

5.6.7 File attachment section

The original form has a file attachment area for faxes and supporting documentation. We can recreate this section using electronic file attachments. The IBM Workplace Forms application allows for the inclusion of any file type.

In this section we provide the tools necessary to allow users to attach files and supporting documentation. The form keeps a count of the number of attachments, displays an indicator when a file has been attached, and includes attachment buttons, which let users attach files to a form, save attachments to their computer, display attachments, or remove attachments from a form.

Attachments

An attachment is a separate file that is attached to a form. An attachment can be any *office suite* file, an HTML document, an image, or any other type of document or file. Attachments are useful in the following situations:

- Attaching a document to a form so users can easily access and view the document. For example, an insurance application form may have an attached brochure containing detailed information describing the available insurance plans.
- Allowing users to attach documents to a form. For example, an employment application form may require the user to attach his resume.

Attachments are not displayed on the form. Attachments are stored within the actual form, unlike e-mail attachments, which are separate files. After you attach a file to a form, changes to the original file on the user's computer do not affect the file attached to the form.

Attachments are stored in file folders within the form. Before you design a form, plan the folders that you intend to use. For example, if you are creating an employee form, you may want to create two folders: one for performance evaluations and one for the employee's history. You may also want to limit which folders users can access. During form design, you define these folders as you attach files and set up attachment buttons.

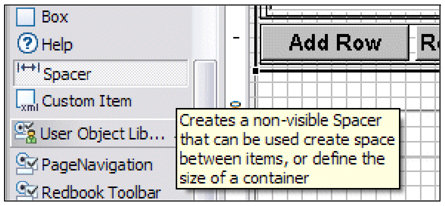
Spacing items

Because relative positioning relies on using other items as points of reference, you often need to include invisible points of reference in order to put space between your items or position your items exactly where you want them. You can use spacers to create these invisible points of reference and to create space between items on your form. Since the remainder of the items on this form are placed below a dynamic table, spacer items are required between the remaining form sections.

For example, suppose that you have a field that is positioned below a label, and you want to put some space between the two items. All you would need to do is create a spacer, position it below the label, and then position the field below the spacer. You can then adjust the size of the spacer so that it keeps the correct amount of space between the other two items.

To use spacers as invisible reference points for relative positioning:

1. In the palette, click **Spacer**, as shown in Figure 5-81.



Creates a non-visible Spacer that can be used create space between items, or define the size of a container

Figure 5-81 Select Spacer item

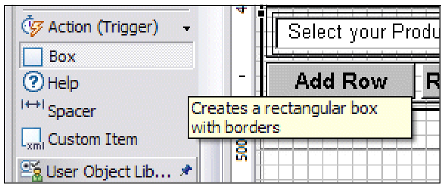
2. Click the page.
3. Relative align the spacer below the TABLEORDERDETAILS_PANE item.

This spacer now acts like a buffer to the next item to be placed on the form. Click **Preview**. Once the form is open, notice that the spacer is invisible.

Create attachment

In this section we use a box item to define the area to be used for attachments. Inside this box we include all of the items necessary to manage our attachments. To create the box, follow the steps bellow:

1. Select **Box** from the palette, as shown in Figure 5-82.



Creates a rectangular box with borders

Figure 5-82 Select Box item

2. Click the page to place it.
3. Change the sid to `AttachmentBox`.
4. Place the box item over the template area where the attachment section is shown.
5. Use the template image to size the box so that it is the same height and width of the template.
6. Relative align to place the box below the spacer on the form.

Create label

We need to place a label in a box to replicate what was there for the original form. To create the label, follow the steps outlined below:

1. Select a **Label (Non-XForms)** item from the palette.
2. Place it on the form.
3. Define the properties for this item, as shown in Table 5-13.

Table 5-13 Label properties

Property	Value	Description
General → sid	LABELAttachFaxDocuments	Unique identifier.
General → value	Attach fax and/or supporting documents	Display value.
General → itemlocation → alignt2t	AttachmentBox	Relative align top to top with the AttachmentBox item.
General → itemlocation → alignl2l	AttachmentBox	Relative align left to left with the AttachmentBox item.
Appearance → justify	left	Ensures that the string will be left justified.
Appearance → font	10 Helvetica (Bold)	Specifies font type, size, and style.

Preview the form. When finished, the new form items should look like those shown in Figure 5-83 and adjust for changes to the products table.

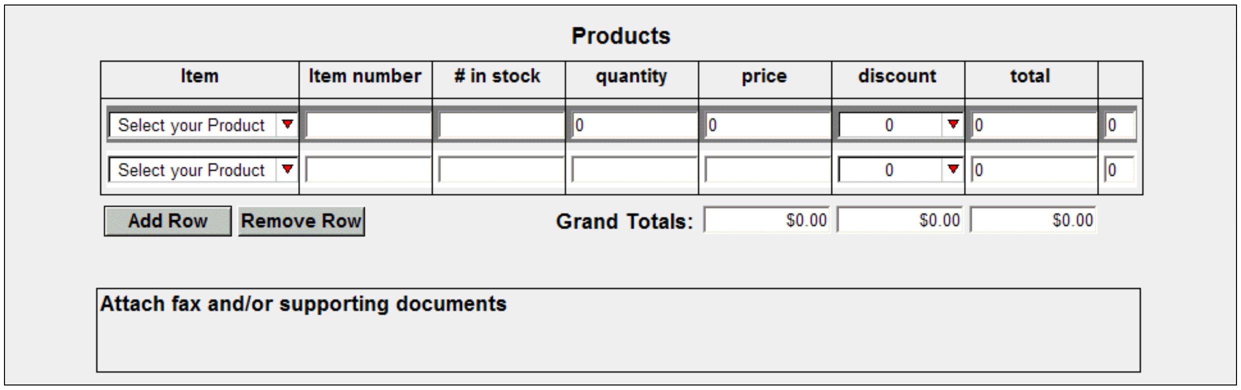


Figure 5-83 New attachment box and label

Add graphics

We want to add some visual indicators that the form has file attachments, otherwise they may be overlooked after the files have been attached to a form. The files we enclose are named:

- paperclip.bmp
- FileAttached.gif

Tip: It is a good idea to keep all associated files and folders in the same folder of your workspace so that the original files can be referenced if necessary in the future. Also, it makes it easier to add an enclosure by dragging it from your workspace folder to the Enclosures view.

Adding an image file to a form

Before you can add an image to a form or to an item (such as a button or a label), you need to enclose the image as a data file for a specific page in the Enclosures view. We have already identified the Resource page for all of our enclosures.

To enclose the paper clip and the file attached image file:

1. In the Enclosures view, select the **Resources** page under Data.
2. Right-click and select **Enclose File**.
3. Browse to the location of the paper clip image file.
4. Select the file and click **Open**.
5. Drag and drop image files to the AttachmentBox item on your form. Do not be concerned about exact placement on the form at this time. They need to be relative aligned to other form items once they have been added.

   Note: Unlike XForms panes, box items do not behave as a container and do not resize automatically if items are placed on top. If necessary, resize either the AttachmentBox item or the graphics so that they fit appropriately. We resize the File_Attach_Icon item to width = 87, height = 47.

6. Set the sid for each graphic to Paper_Clip_Icon and File_Attach_Icon, respectively.
7. Repeat the previous six steps to attach the second file.

Note: You can also add an image file to a form by dragging the file from your workspace or Windows Explorer onto the PAGE in the Enclosures view.

You can now add the image directly onto your form, or to label or button items on your form. When you copy the label or button using an image to another page in the form, the image is referenced to the original file.

Note: The information contained in Pages in the Enclosures view does not show you where the enclosure is displayed. It shows you where the actual data resides. Images are stored as data items. When you enclose a file, a data item is created for that specific page.

Add buttons

In order to attach and manage files in our form we need to add a number of buttons. In this section we cover the following topics:

- Create attachment buttons.
- Add Attachment button.

- View Attachment button.
- Remove Attachment button.
- Save Attachment button.

Create attachment buttons

Attachment buttons let the user:

- Attach a file to a form.
- Display an attachment (a file that is attached to a form).
- Extract an attachment from a form and save it as a file.
- Remove an attachment from a folder or from the form.

Note: You can use cells, instead of buttons, to let users work with attachments. The procedure for creating attachment cells is similar to the procedure for creating attachment buttons.

If your form uses XForms, you can also use the XForms Upload item to let users attach a file to a form.

To create an attach, display, extract, or remove button:

1. Select a non-XForms button from the palette, add it to the form, and then select it.
2. In the Properties view, expand the **General** section.
3. Click in the type value field and click one of the following:
   - enclose — attaches a file to a form
   - display — displays an attachment (in an application determined by the attachment's MIME type)
   - extract — extracts an attachment and saves it as a file
   - remove — removes an attachment from a folder (if the attachment belongs to more than one folder) or from the form (if the attachment belongs to only one folder)
4. Expand the datagroup property.
5. Click within the Data Group Refs value field.
6. Click the plus button to add a datagroupref property.
7. In the datagroupref value field, type the name of the folder that you want the action to access. Folder names can include uppercase letters, lowercase letters, numbers, and underscores. For this section we have named our folder *Attachments*.

   Note: To allow the action to access additional folders, click within the Data Group Refs value field and click an image of a plus button to add additional datagroupref properties. Otherwise, to set up the button to display, extract, or remove a specific file that is already attached to the form, and set data to the name of the attachment.

Restriction: You can use an Enclose button in the preview to attach files to a form. However, the attachments will not be saved with the form when you return to the Design view. To save the attachments with the form, in the Preview panel, click the **Save Form** button.

Add Attachment button

Use the instructions provided in “Create attachment buttons” on page 264 to add a button to the form with the following properties as shown in Table 5-14.

Table 5-14 Add Attachment button properties

Property	Value (ref)	Description
General → sid	add_document	Unique Identifier.
General → value	Add	Display value.
General → type	enclose	Performs the enclose function.
General → datagroup → Data Group Refs → 1:datagroupref	Attachments	Specifies where the files will be stored in the form.
General → itemlocation → > alignl2c	LABELAttachFaxDocuments	Relative align left to center of LABELAttachFaxDocuments item.
General → itemlocation → alignt2b	LABELAttachFaxDocuments	Relative align top to bottom of the LABELAttachFaxDocuments item.
General → itemlocation → height	25	Set height to 25 pixels.
General → itemlocation → width	100	Set width to 100 pixels.
Appearance → justify	center	Ensures that the string will be left justified.
Appearance → font	8 Helvetica (Bold)	Specifies font type, size, and style.

View Attachment button

Use the instructions provided in “Create attachment buttons” on page 264 to add a button to the form with the properties listed in Table 5-15.

Table 5-15 View Attachment button properties

Property	Value	Description
General → sid	view_document	Unique Identifier.
General → value	View	Display value.
General → > type	display	Performs the display function.
General → itemlocation → after	add_document	Relative align after the add_document item.
General → itemlocation → height	25	Set height to 25 pixels.
General → itemlocation → width	100	Set width to 100 pixels.
Appearance → justify	center	Ensures that the string will be left justified.
Appearance → font	8 Helvetica (Bold)	Specifies font type, size, and style.

Remove Attachment button

Use the instructions provided in “Create attachment buttons” on page 264 to add a button to the form with the properties listed in Table 5-16.

Table 5-16 Remove Attachment button properties

Property	Value	Description
General → sid	remove_document	Unique Identifier.
General → value	Remove	Display value.
General → type	remove	Performs the remove function.
General → itemlocation → > after	view_document	Relative align after the view_document item.
General → itemlocation → height	25	Set height to 25 pixels.
General → itemlocation → width	100	Set width to 100 pixels.
Appearance → justify	center	Ensures that the string will be left justified.
Appearance → font	8 Helvetica (Bold)	Specifies font type, size, and style.

Save Attachment button

Use the instructions provided in “Create attachment buttons” on page 264 to add a button to the form with the properties listed in Table 5-17.

Table 5-17 Save Attachment button properties

Property	Value	Description
General → sid	SaveDocumentAs	Unique Identifier.
General → value	Save	Display value.
General → type	save	Performs the save function.
General → itemlocation → after	remove_document	Relative align after the remove_document item.
General → itemlocation → height	25	Set height to 25 pixels.
General → itemlocation → width	100	Set width to 100 pixels.
Appearance → justify	center	Ensures that the string will be left justified.
Appearance → font	8 Helvetica (Bold)	Specifies font type, size, and style.

Add File Attachment Count label

To count the number of files that are currently attached to the form we need to add logic to the form, and show the results to the end user.

Position paper clip graphic

Before we can position this item on the form we need to first position the Paper_Clip_Icon item. Use relative alignment to place the Paper_Clip_Icon item after the SaveDocumentAs button item. Then use relative alignment again to align the Paper_Clip_Icon item vertically center to the center with the SaveDocumentAs button.

Create label

Add a non-XForms label to the form with the properties listed in Table 5-18.

Table 5-18 Label count properties

Property	Value	Description
General → sid	Attachment_Count_LABEL	Unique Identifier.
General → value	0	Display zero (0) as value.
General → itemlocation → height	32	Set height to 32 pixels.
General → itemlocation → width	32	Set width to 32 pixels.
General → itemlocation → after	Paper_Clip_Icon	Relative align after the Paper_Clip_Icon item.
General → itemlocation → alignvertc2c	Paper_Clip_Icon	Relative align vertically center to center with the Paper_Clip_Icon item.
Appearance → justify	Center	Ensures that the string will be left justified.
Appearance → font	10 Helvetica (plain)	Specifies font type, size, and style.

Position file attachment graphic

Relative align to place the File_Attach_Icon item after the Attachment_Count_LABEL label item. Then use relative alignment again to align the File_Attach_Icon item vertically center to the center with the Attachment_Count_LABEL label.

Create XFDL computes

To make the form more interactive we are going to add conditional logic to the items we just created. Since all of the items in this form Attachment section are XFDL items, we use XFDL computes to add the necessary logic.

- If there are no attachments, then hide the following items:
  - Paper clip icon
  - Counter label
  - File Attached label
- If there are no attachments, then disable the following items:
  - View button
  - Remove button
  - Save button

Update counter

The counter is the key factor in how these items display. First, we create a custom option to check to see when the Attach button or the Remove button is activated. Next we create a conditional statement that checks the custom option and, depending on the value returned, uses an existing XFDL function to count the number of data items present in the attachment folder of the form.

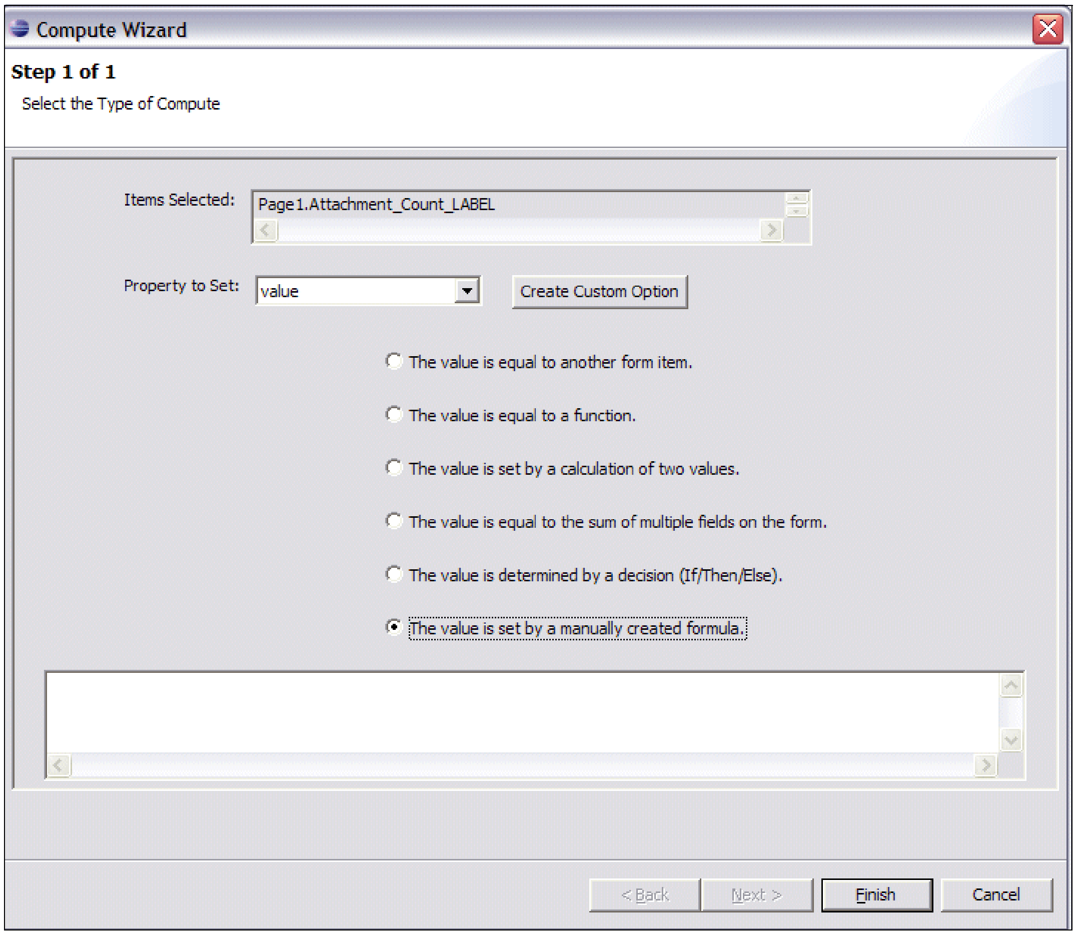
In this section we cover the following topics:

- Define custom option.
- Add compute to custom option.
- Create compute.
- Hide items.
- Disable buttons.

Define custom option

We want to create an option that is able to monitor whether the Add or Remove buttons have been activated, and if so we need it to retain a result. The compute wizard can be used to define the custom option needed. Follow the steps below to create the custom option and a compute that does that.

1. Right-click the **Attachment_Count_LABEL** item in the Designer.
2. Select **Wizard** → **Compute Wizard**.
3. When the wizard loads select **Create Custom Option**, as shown in Figure 5-84.



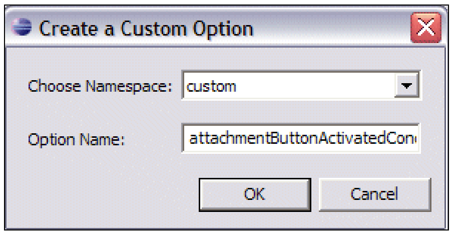
Items Selected: Page1.Attachment_Count_LABEL

Property to Set: value

- The value is equal to another form item.
- The value is equal to a function.
- The value is set by a calculation of two values.
- The value is equal to the sum of multiple fields on the form.
- The value is determined by a decision (If/Then/Else).
- [✓ The value is set by a manually created formula.]

Figure 5-84 Create custom option

4. On the next screen of the wizard, provide a unique name to the custom option. We use attachmentButtonActivatedConcat, as shown in Figure 5-85.



Choose Namespace: custom

Option Name: attachmentButtonActivatedCon

Figure 5-85 Designate option name

When finished instantiating your custom option, you are returned to the first wizard page. This allows us to apply some logic to our new option. Remain in the wizard, but consider that if we were to exit out of the wizard now and look into the source code we would see the code shown in Example 5-15.

Example 5-15 Custom option without a compute

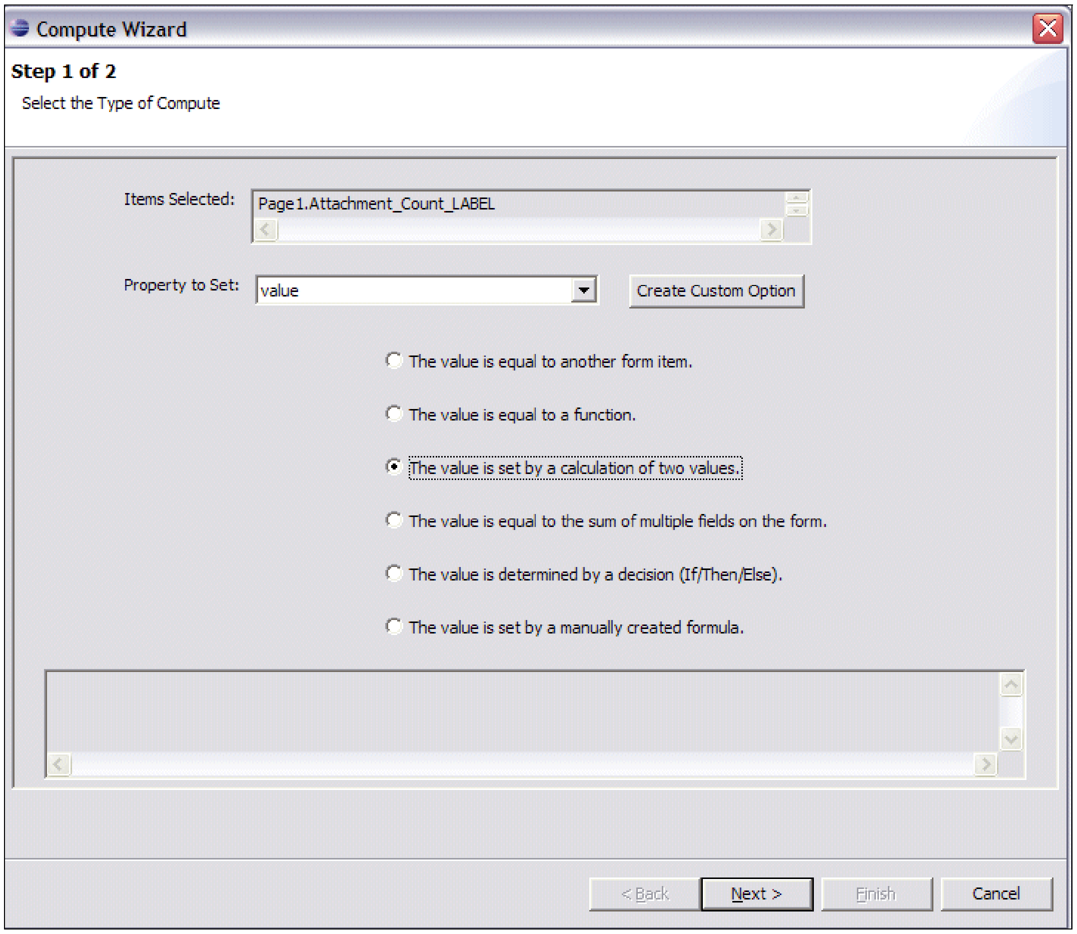
```
<custom:attachmentButtonActivatedConcat></custom:attachmentButtonActivatedConcat>
```

Add compute to custom option

We now need to add some logic to our new option. To do this follow the steps outlined below.

Attention: As you go through these steps, pay attention to the window at the bottom of the screen that shows the source code being generated.

1. While still in the wizard, select the **The value is set by a calculation of two values** option, as shown in Figure 5-86. Click **Next**.



Items Selected: Page1.Attachment_Count_LABEL

Property to Set: value

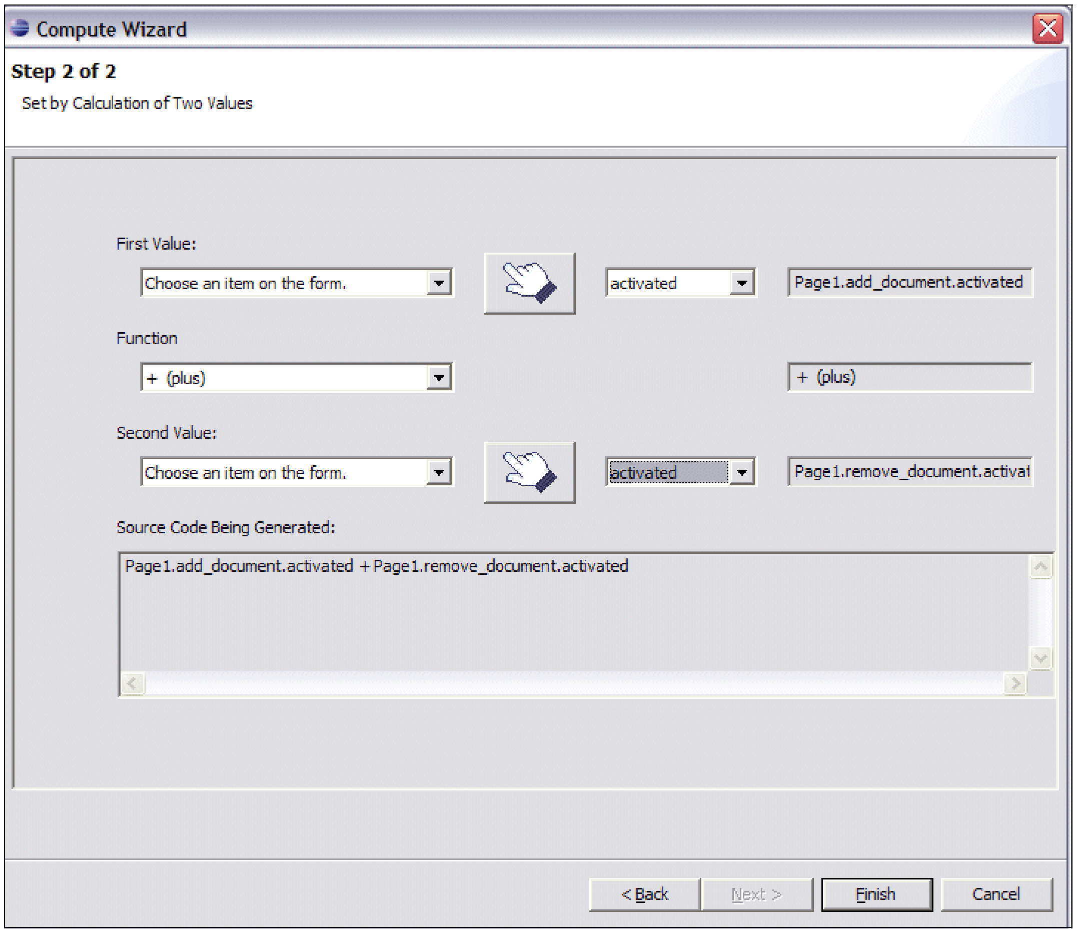
- ( ) The value is equal to another form item.
- ( ) The value is equal to a function.
- (●) The value is set by a calculation of two values.
- ( ) The value is equal to the sum of multiple fields on the form.
- ( ) The value is determined by a decision (If/Then/Else).
- ( ) The value is set by a manually created formula.

Figure 5-86 Set calculation

2. For the first value, use the drop-down list to select the option to **choose an item on the form**.
3. A hand pointer is presented. When you click this pointer the wizard temporarily disappear from view and the form, which is underneath, is exposed.
4. Select the **Add attachment** button.
5. The wizard returns. Immediately to the right of the hand pointer is a list of options for the item selected.
6. Choose **activated** from the list.
7. Select the plus sign (**+**) as the function for our calculation.
8. For the second value, use the drop-down list to select the option to **choose an item on the form**.

9. Again the hand pointer is presented. Click it as before.
10. Select the **Remove attachment** button.
11. When the wizard returns choose the **activated** option from the list to the right.

When finished your settings should be the same as those shown in Figure 5-87.



First Value: Choose an item on the form. | activated | Page1.add_document.activated

Function: + (plus) | + (plus)

Second Value: Choose an item on the form. | activated | Page1.remove_document.activat

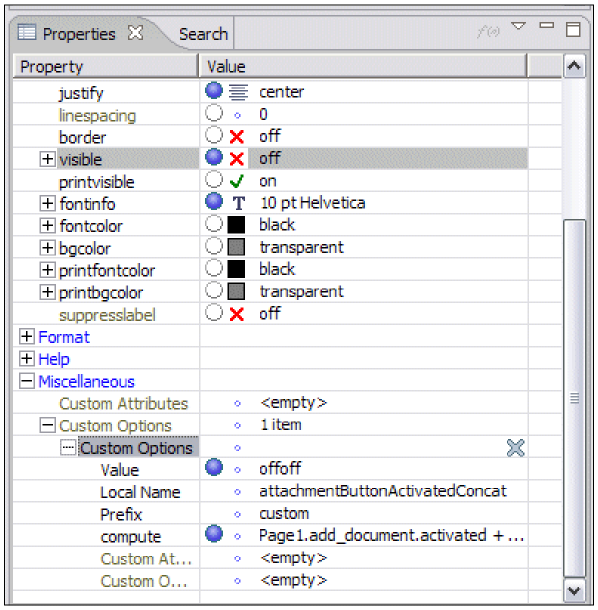
Source Code Being Generated:

```
Page1.add_document.activated + Page1.remove_document.activated
```

Figure 5-87 Compute wizard set by calculation of two values

12. Click **Finish** after comparing your settings to those shown above. You then return to the Designer.
13. In the Properties view of the Attachment_Count_LABEL item, scroll to the bottom to set the value of our new option.
14. Expand the **Miscellaneous** section.
15. Expand **Custom Options** and you will see the option we just defined.

16. Set the value equal to offoff, as shown in Figure 5-88.



Property	Value
justify	center
linespacing	0
border	off
visible	off
printvisible	on
fontinfo	10 pt Helvetica
fontcolor	black
bgcolor	transparent
printfontcolor	black
printbgcolor	transparent
suppresslabel	off
Format	
Help	
Miscellaneous	
Custom Attributes	<empty>
Custom Options	1 item
Custom Options	
Value	offoff
Local Name	attachmentButtonActivatedConcat
Prefix	custom
compute	Page1.add_document.activated + ...
Custom At...	<empty>
Custom O...	<empty>

Figure 5-88 Custom option as displayed in the Properties view

The complete set of source code for the option we create with the compute is shown is Example 5-16.

Example 5-16 Custom option with compute

```
<custom:attachmentButtonActivatedConcat xfdl:compute="add_document.activated &#xA;
+ remove_document.activated">offoff</custom:attachmentButtonActivatedConcat>
```

Create compute

We apply logic here that calculates the value displayed for the Attachment_Count_LABEL item. Like the previous state, this XFDL compute uses a custom option, except this time we use the Source editor to create it. Use the steps below to create the custom option.

1. While still in the Designer, click the **Attachment_Count_LABEL** item.
2. Click the **Source** tab. When the Source editor loads, you are brought directly to the source for the label.
3. In the Source editor enter the following code to create a custom option by entering the following tags:

   ```
   <custom:update></custom:update>
   ```

4. Building the conditional statement:
   a. We use the toggle function to monitor the value of the custom option, attachmentButtonActivatedConcat, which changes with the activation of either the Add or Remove button.
   b. If a change does occur we use an XFDL function to set the value of our label. Otherwise do nothing or null.
   c. countDatagroupItems is the function we use. It returns the number of items in a particular data group. The parameter requires the name of the grouped item. Selecting non-grouped items creates a null entry.

5. If we use the logic outlined in step 4 above, then the calculation can be written as shown in Example 5-17.

Example 5-17 Custom option with conditional compute

```
<custom:update xfdl:compute="&#xA;
      ((toggle(custom:attachmentButtonActivatedConcat) == '1') &#xA;
      and (custom:attachmentButtonActivatedConcat == 'offoff')) &#xA;
   ? (set('value', countDatagroupItems('Attachments'))) &#xA;
   : ''">
</custom:update>
```

6. Insert the XFDL custom option and associated compute code into the source for Attachment_Count_LABEL, as shown in Example 5-18.

Example 5-18 Insert custom option

```
<label sid="Attachment_Count_LABEL">
   <itemlocation>
      <width>32</width>
      <height>32</height>
      <after>Paper_Clip_Icon</after>
      <alignvertc2c>Paper_Clip_Icon</alignvertc2c>
   </itemlocation>
   <value>0</value>
   <fontinfo>
      <fontname>Helvetica</fontname>
      <size>10</size>
   </fontinfo>
   <custom:attachmentButtonActivatedConcat xfdl:compute=" &#xA;
      Page1.add_document.activated &#xA;
      + Page1.remove_document.activated &#xA;
      ">offoff</custom:attachmentButtonActivatedConcat>
   <custom:update xfdl:compute="&#xA;
      ((toggle(custom:attachmentButtonActivatedConcat) == '1') &#xA;
         and (custom:attachmentButtonActivatedConcat == 'offoff')) &#xA;
         ? (set('value', countDatagroupItems('Attachments'))) &#xA;
         : ''">
   </custom:update>
</label>
```

Preview the form to test the counter label. Try adding and removing more than one file. In the next section we use this count to determine what is active or not, and what is hidden or not.

Hide items

This is a pretty simple compute. Basically, if the value of the Attachment_Count_LABEL is zero (0), then hide items otherwise shown. Example 5-19 shows the XFDL compute.

Example 5-19 Conditional statement

```
<visible compute="      &#xA;
            Attachment_Count_LABEL.value == '0'  &#xA;
            ? 'off'      &#xA;
            : 'on'">off</visible>
```

Open the Source editor and apply the compute statement to the visible option of the following items:

- Paper_Clip_Icon
- Attachment_Count_LABEL
- File_Attach_Icon

Use the search feature in the Source editor (Ctrl+F) to search for the sids shown above to speed up your navigation of the code.

Disable buttons

This same computation can be applied to the button items on the form that we want to disable. Modify the compute so that it is applied to the active status of the buttons. The updated code is shown in Example 5-20.

Example 5-20 Active compute

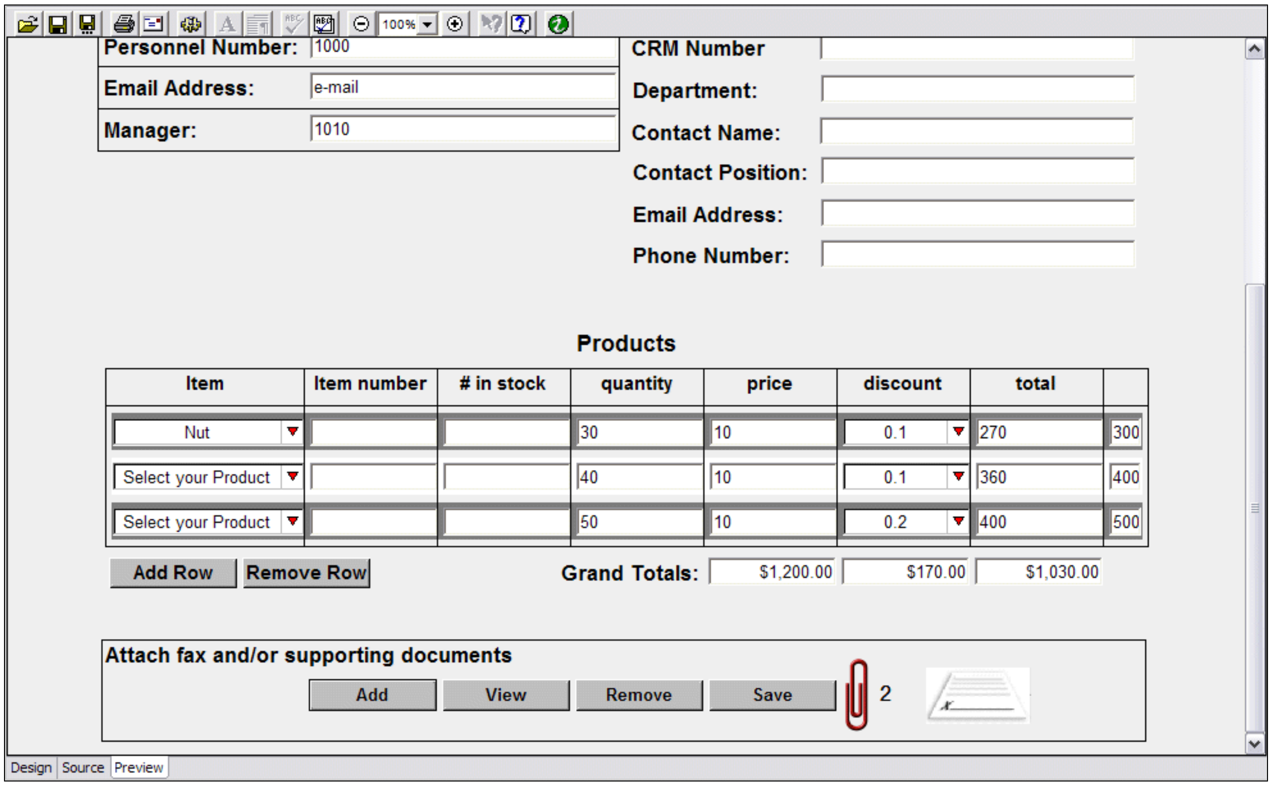
```
<active compute="      &#xA;
   Attachment_Count_LABEL.value == '0'  &#xA;
   ? 'off'      &#xA;
   : 'on'">off</active>
```

Open the Source editor and apply compute statements to the visible option of the following buttons:

- view_document
- remove_document
- SaveDocumentAs

Use the search feature in the Source editor (Ctrl+F) to search for the sids shown above to speed up your navigation of the code.

That completes this section of the form. Preview and test the form. When finished your form should look like that shown in Figure 5-89.



Personnel Number:	1000	CRM Number	
Email Address:	e-mail	Department:	
Manager:	1010	Contact Name:	
		Contact Position:	
		Email Address:	
		Phone Number:	

Products

Item	Item number	# in stock	quantity	price	discount	total	
Nut			30	10	0.1	270	300
Select your Product			40	10	0.1	360	400
Select your Product			50	10	0.2	400	500

Grand Totals: $1,200.00 $170.00 $1,030.00

Attach fax and/or supporting documents

2

Figure 5-89 Preview and test form

Preview the form again and test the behavior of the file attachment sections. Make sure that the appropriate items are shown and hidden. Also, test to make sure that the buttons are disabled and enabled based on the number of items attached to the form. Lastly, and possibly most important, make sure that all items in this section are repositioned correctly when you add and remove rows on the product order table above.

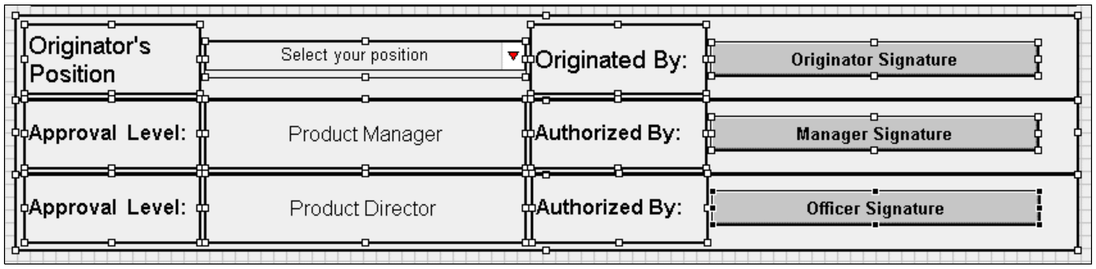
5.6.8 Signature section of form

In this section we recreate the signature section of the form. Once again we can enhance this section through the use of some of the features and functions of the IBM Workplace Forms Designer. One significant benefit is the addition of multiple overlapping electronic signatures. Later in this chapter we show how to add business logic to the form that dictates required signatures based on form state. In this section we cover the following topics:

- Layout items
- Configure POPUP1
- Signature buttons

Layout items

Since many of the steps necessary to recreate the signature area of our form have already been covered in prior sections of this chapter, in this section we take a different approach. Figure 5-90 shows a selection of all the items required to build the signature section. Using the skills learned earlier in this chapter and in Chapter 2, "Features and functionality" on page 19, recreate the area as shown below.



Originator's Position	Select your position	Originated By:	Originator Signature
Approval Level:	Product Manager	Authorized By:	Manager Signature
Approval Level:	Product Director	Authorized By:	Officer Signature

Figure 5-90 Signature section items

Tips: To get you started here are some tips:

- Use non-XForms labels.
- Use a spacer below the attachment box.
- Use relative alignment rules when placing the box, buttons, labels, and other items in this section of the form.
- Always formally name your items before aligning them with relative positioning rules.
- When laying out the items in the box, it is usually easier to start in the upper left corner with the first label and build off of it.
- Use a Popup (Select1) XForms item for the list, and leave the default sid (POPUP1). We cover the configuration details later in this section.
- Use non-XForms Button items for the signature items. We will provide detailed configuration details later in this section. The sids for these items are listed below from top to bottom as placed on the form:
  - OriginatorSignatureBUTTON
  - ManagerSignatureBUTTON
  - OfficerSignatureBUTTON

Step-by-step configuration details are provided for the advanced items listed below:

- POPUP1
- OriginatorSignatureBUTTON
- ManagerSignatureBUTTON
- OfficerSignatureBUTTON
- Model binds

Configure POPUP1

POPUP1 is an XForms popup that allows only one selection. To configure it we need to bind it to an instance. The instance we use is the PositionList and is shown in Example 5-21.

Example 5-21 XForms Instance for POPUP1

```
<!-- this is an instance for the choices list associated with employment positions
on Page1 -->
<xforms:instance id="PositionList" xmlns="">
   <Positions>
      <Position>Sales Representative</Position>
      <Position>Product Manager</Position>
      <Position>Product Director</Position>
   </Positions>
</xforms:instance>
```

Set the properties for this instance as shown in Table 5-19.

Table 5-19 POPUP1 properties

Property	Value (ref)	Description
General → sid	POPUP1	Unique identifier.
General → value	Select your position	Displayed value to end user before selection.
Appearance → justify	center	Center the text.
Appearance → border	off	Turn off the border.
Appearance → fontinfo	8 point, Arial	Font size and type.
XForms (Select1) → itemset → Value	(on)	Make sure the circle in the value column is on, or blue.
XForms (Select1) → itemset → nodeset	instance('PositionList')/Position	Specify what elements will be used to populate the list.
XForms (Select1) → ref	instance('FormOrderData')/OriginatorRole	Specify what element will be populated with the selected value.

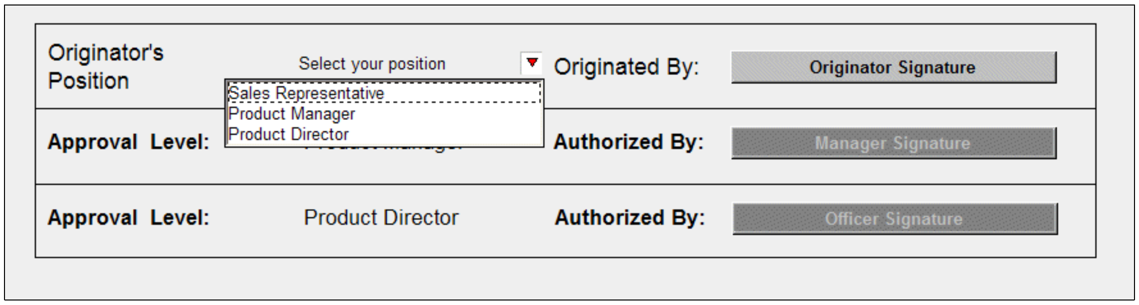
Signature buttons

We use non-XForms buttons to create our signatures. At this stage of form development we do not add any signature rules because we have yet to build the entire form and therefore cannot create the necessary filters for the ClickWrap signatures that will be used. For now, just add the buttons to the form and align them appropriately.

For more details on signature buttons please see 2.7, "Signature buttons" on page 108.

Note: You cannot place a signature button into a pane or table item's template (that is, the content of the xforms:group, xforms:repeat, or xforms:switch). Although it is possible to do in the Designer, this button does not function correctly in the Viewer. However, a signature button can sign any XFDL, including panes and tables and the data to which their contained controls bind.

Preview the form to confirm that all of the settings are correct. When finished it should appear as shown in Figure 5-91. Be sure to test the relative alignment rules for this section by adding and removing lines from the dynamic table on this page.



Originator's Position	Select your position ▼ (Sales Representative / Product Manager / Product Director)	Originated By:	Originator Signature
Approval Level:	Product Manager	**Authorized By:**	Manager Signature
Approval Level:	Product Director	**Authorized By:**	Officer Signature

Figure 5-91 Preview signature section

5.7 Enhancing the form

Up to this point in the form design process we have been more concerned with form layout and functionality than the look and feel of the form sections that we have created. Since we have completed the representation of the original form we can now enhance the form by adding borders, colors, and navigational objects.

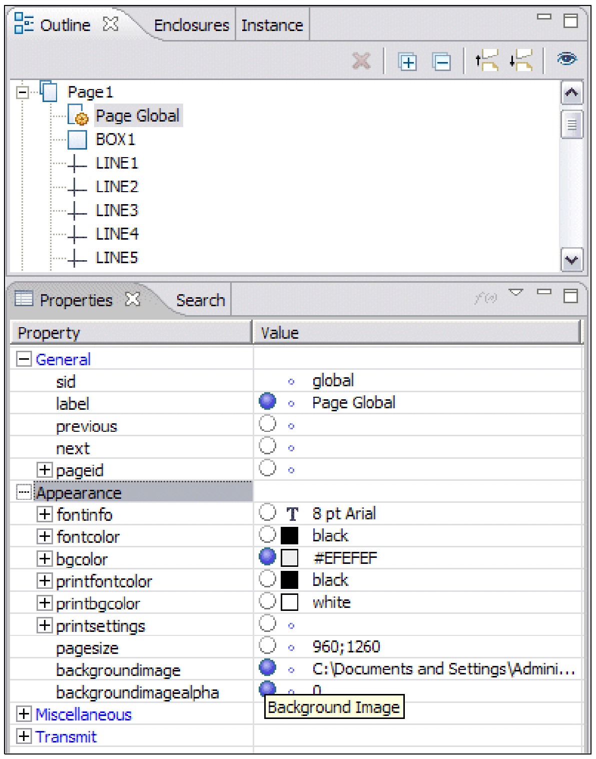
5.7.1 Remove the form template

The basic form layout is complete for the original form. We have matched the items as closely as possible to the original form without sacrificing functionality available to us. Although the new form is not a pixel perfect rendition of the original form, what we have gained in form design and functionality is of greater benefit.

To remove the form template follow the steps below:

1. In the Designer, go the Outline view.
2. Select the **Page Global** item under Page1.

3. In the Properties view for this item go to **Appearance** → **backgroundimage**, as shown in Figure 5-92.



Property	Value
General	
sid	global
label	● Page Global
previous	○
next	○
pageid	○
Appearance	
fontinfo	○ T 8 pt Arial
fontcolor	○ ■ black
bgcolor	● □ #EFEFEF
printfontcolor	○ ■ black
printbgcolor	○ □ white
printsettings	○
pagesize	○ 960;1260
backgroundimage	● C:\Documents and Settings\Admini...
backgroundimagealpha	● 0
Miscellaneous	
Transmit	

Background Image

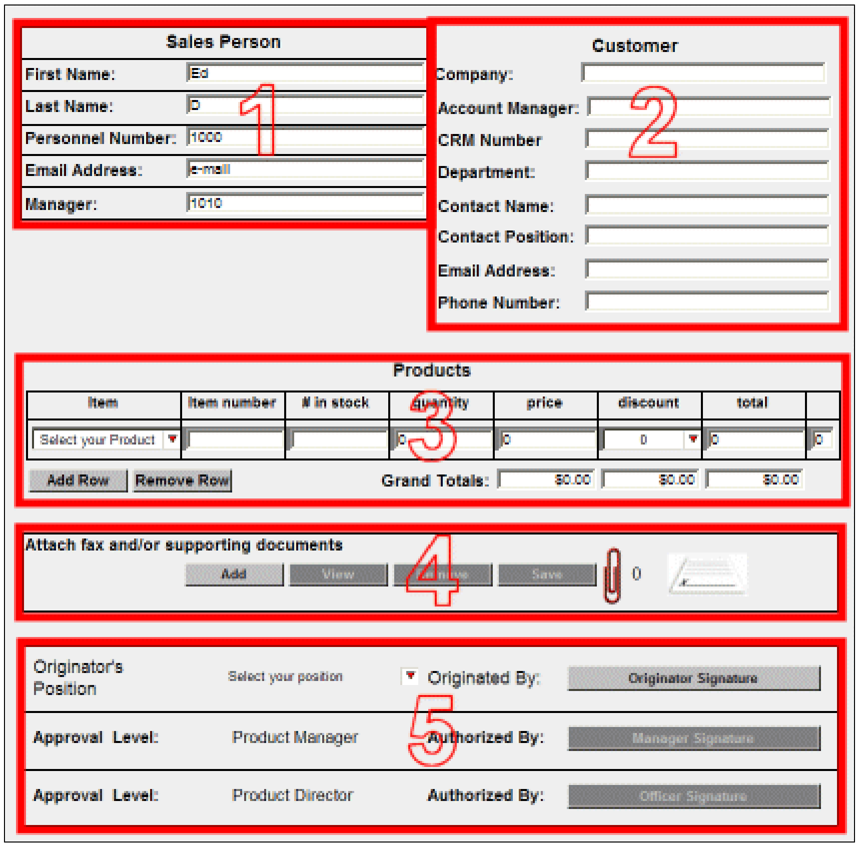
Figure 5-92 Remove form template

4. Turn off the setting by clicking the blue circle once. The circle turns white, and the path to the image file is removed.

5.7.2 Distinguishing sections of the form

We have divided the traditional form page into five logical sections, as shown in Figure 5-93:

- Sales person section
- Customer section
- Products section
- File attachments section
- Signature and approval section



Sales Person

First Name:	Ed
Last Name:	D
Personnel Number:	1000
Email Address:	e-mail
Manager:	1010

Customer

Company:	
Account Manager:	
CRM Number	
Department:	
Contact Name:	
Contact Position:	
Email Address:	
Phone Number:	

Products

Item	Item number	# in stock	quantity	price	discount	total	
Select your Product			0	0	0	0	0

Grand Totals: $0.00 $0.00 $0.00

Attach fax and/or supporting documents

Originator's Position	Select your position	Originated By:	Originator Signature
Approval Level:	Product Manager	Authorized By:	Manager Signature
Approval Level:	Product Director	Authorized By:	Officer Signature

Figure 5-93 Five logical sections of the form

You can use different background colors for the boxes to mark up headings and sections of your page. Now that we have duplicated the original format we can enhance it. By making some simple changes to the UI elements we can make this form a little easier to interpret. For each of these sections, we create different boxes that produce a table layout for the labels and fields to be positioned on.

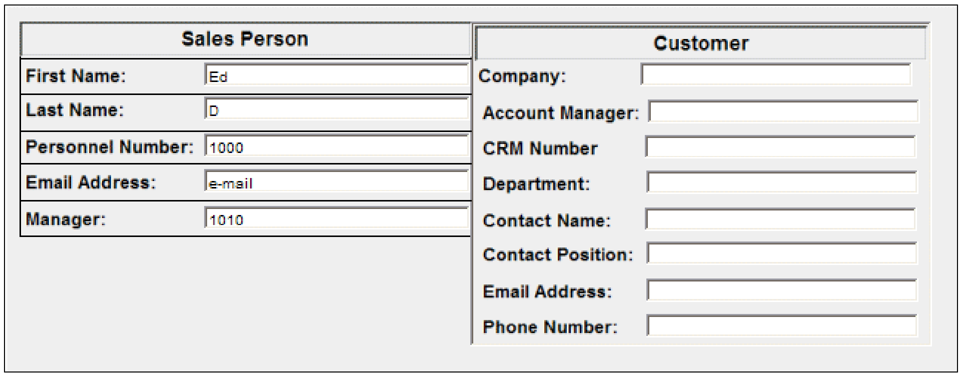
Define borders

One issue with the current state of the form is that the borders are not visible for all form panes. Go through the form and enable the borders for all of the panes. Be sure to preview the form as you go through the process to monitor your changes.

Tip: You can select more than one item at the same time and modify their properties at the same time. For example, you can select all of the headers by holding down the Ctrl key, clicking each item, and setting the desired properties in the Properties view.

Make form sections consistent

After enabling the border property for all of our headers and panes, we notice a couple of inconsistencies between the sales person and customer details sections (see Figure 5-94).



Sales Person

First Name:	Ed
Last Name:	D
Personnel Number:	1000
Email Address:	e-mail
Manager:	1010

Customer

Company:	
Account Manager:	
CRM Number	
Department:	
Contact Name:	
Contact Position:	
Email Address:	
Phone Number:	

Figure 5-94 Inconsistent look and feel

The differences are:

- The sales person section is enclosed by a box, while the customer details items are contained in an XForms pane.
- The sales person section has lines separating its rows, while the customer details section does not.

Early in the form design process we use two different methods to create these sections — the basic method and the XForms Model Instance method. We do this to demonstrate both methodologies, but now it is an issue for us. To resolve this issue, we can add a pane to the form for the sales person items, and then add lines to the customer details section.

Create Pane for Sales Person Section

Follow the steps below to replace the box surrounding the sales person section with a new XForms pane:

1. Delete the box.
2. Add an XForms pane of type group to the Outline view just under the page global item of Page1.
3. Change the following properties for the new pane:
   a. Set the sid of this pane to SalesPane.
   b. Turn on the border property.
4. Using the Outline view, select all the label and field items (including the header) that represent the sales person section.
5. Drag and drop those items into the SalesPane.
6. Reposition the SalesPane using absolute alignment.
   a. Absolute align top to top with the CUSTOMER1 pane.
   b. Absolute align right to left with the CUSTOMER1 pane.

Add lines to the Customer1 pane

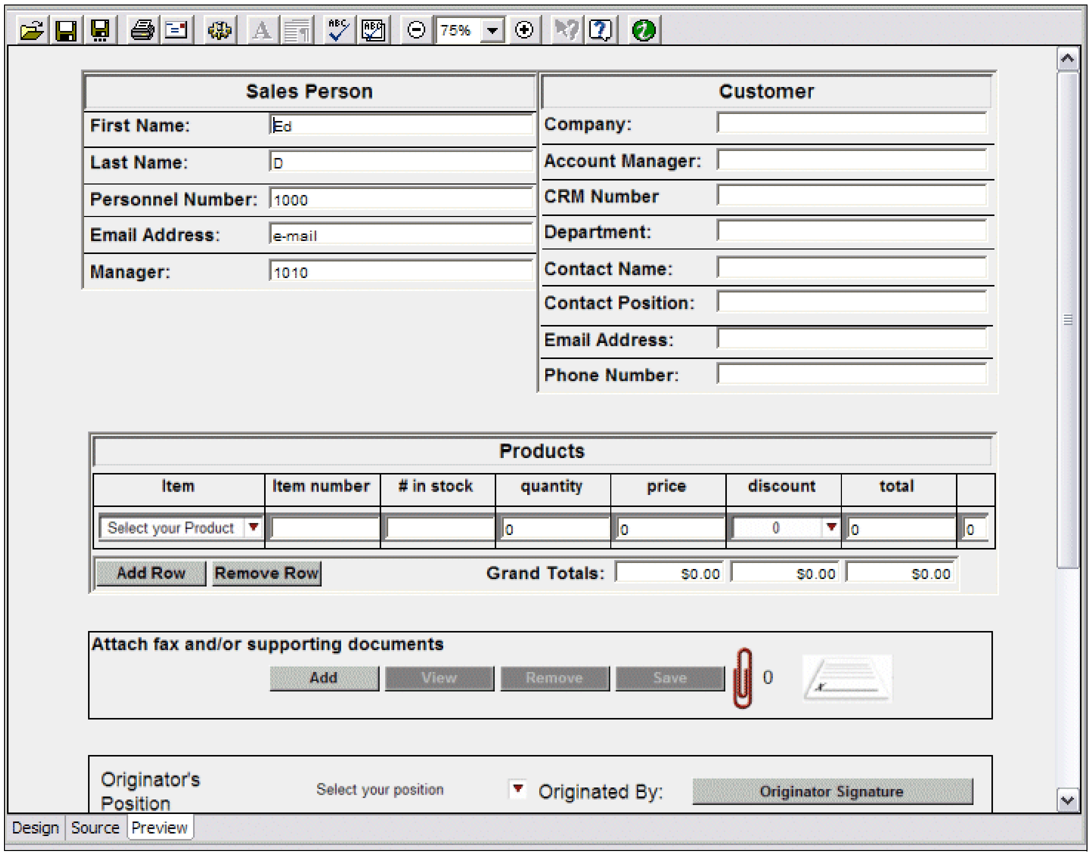
To mimic the design of the SalesPane and the original form layout, we must add lines to the CUSTOMER1 pane. We can copy and paste the lines from the SalesPane into the CUSTOMER1 pane.

Tip: It can be challenging to select lines in the Design canvas. For lines and other small items, it is often easier to use the Outline view to select and modify them.

Using the Outline view to select the lines from the SalesPane, copy those items and paste them into the CUSTOMER1 pane. There are three more rows in the customer section, so you have to add two more lines. Reposition those lines as needed so that they line up exactly with the lines from the SalesPane.

Important: You may need to realign your labels and fields so that everything is aligned properly.

Preview the form to validate your changes. It should look similar to that shown in Figure 5-95.



Sales Person	
First Name:	Ed
Last Name:	D
Personnel Number:	1000
Email Address:	e-mail
Manager:	1010

Customer	
Company:	
Account Manager:	
CRM Number	
Department:	
Contact Name:	
Contact Position:	
Email Address:	
Phone Number:	

Products

Item	Item number	# in stock	quantity	price	discount	total	
Select your Product			0	0	0	0	0

Add Row · Remove Row · Grand Totals: $0.00 $0.00 $0.00

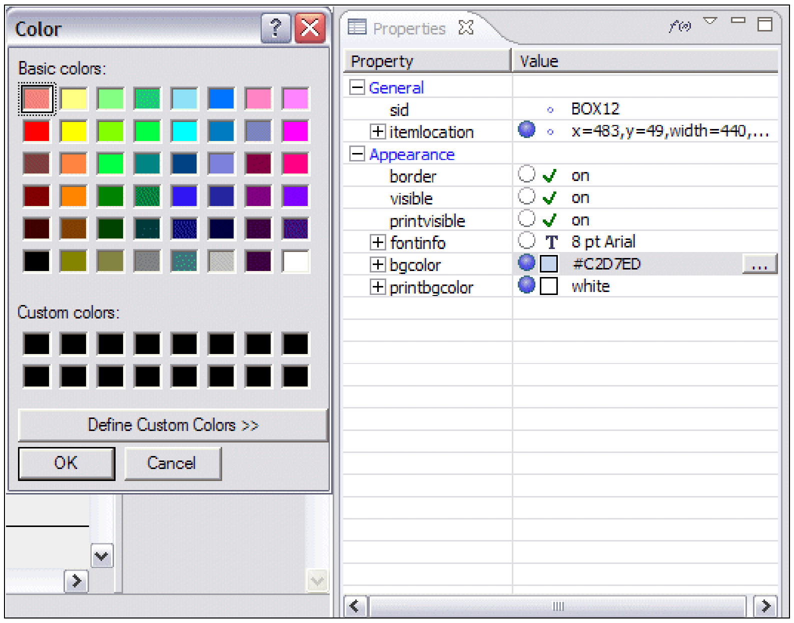
Attach fax and/or supporting documents: Add · View · Remove · Save · 0

Originator's Position: Select your position · Originated By: Originator Signature

Figure 5-95 Preview of new pane and lines

Distinguish form sections

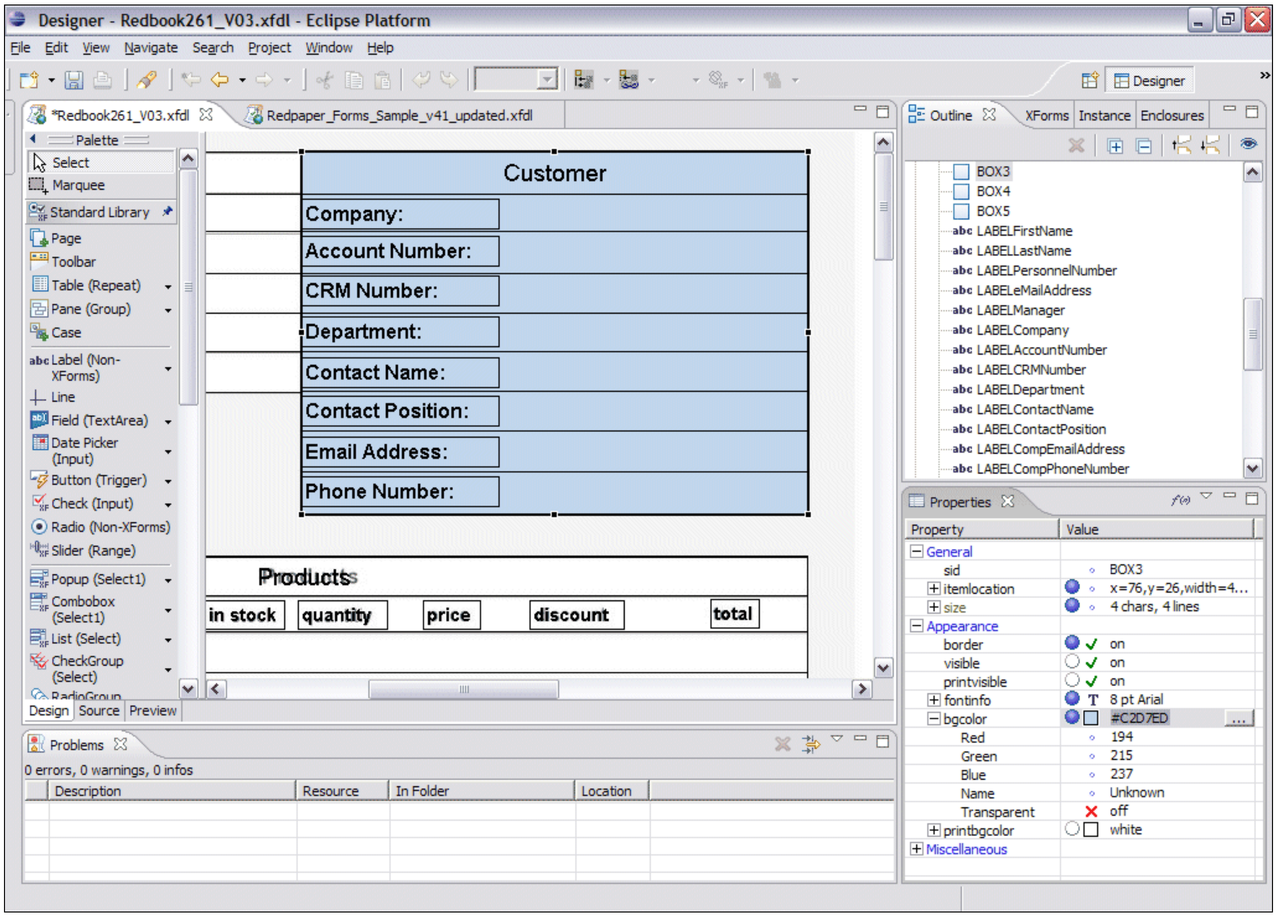
We start by distinguishing the sales person grid from the customer grid. You can configure the background colors in the Appearance category of the Properties view by selecting the bgcolor property and clicking the ellipse button (...), as shown in Figure 5-96. A Color dialog appears, and you can choose from a selection of basic colors, or define your own custom color.



Property	Value
General	
sid	BOX12
itemlocation	x=483,y=49,width=440,...
Appearance	
border	✓ on
visible	✓ on
printvisible	✓ on
fontinfo	T 8 pt Arial
bgcolor	#C2D7ED ...
printbgcolor	white

Figure 5-96   Background color selection of box items

Highlight the pane surrounding the customer section, and go to the Properties view for that pane. Either use the Color dialog box as described above, or change the value of the background color (bkcolor) to #C2D7ED. The result is shown in Figure 5-97.



0 errors, 0 warnings, 0 infos

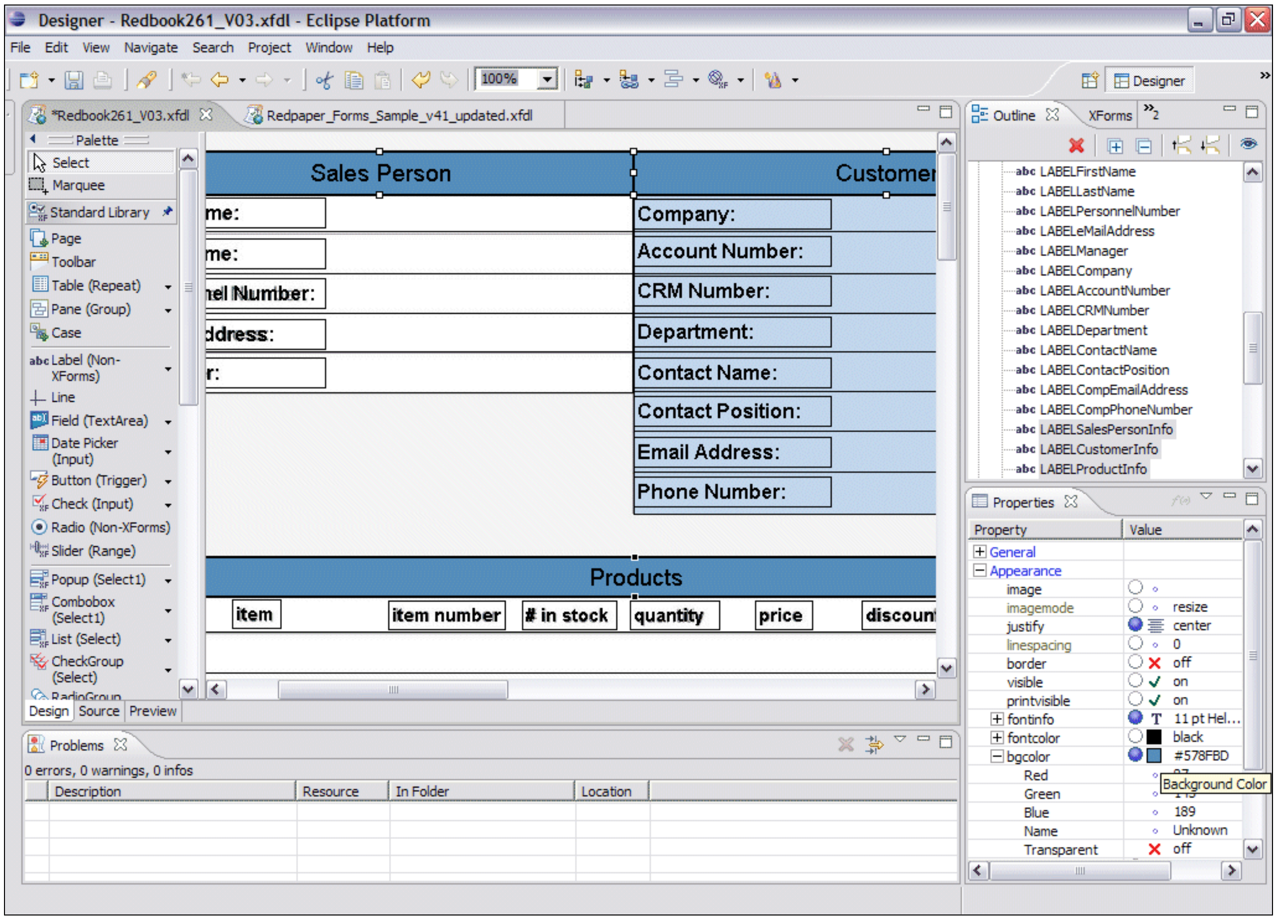
Description	Resource	In Folder	Location

Property	Value
General	
sid	BOX3
itemlocation	x=76,y=26,width=4…
size	4 chars, 4 lines
Appearance	
border	✓ on
visible	✓ on
printvisible	✓ on
fontinfo	8 pt Arial
bgcolor	#C2D7ED
Red	194
Green	215
Blue	237
Name	Unknown
Transparent	off
printbgcolor	white
Miscellaneous	

Figure 5-97 Change background color of Customer box

Distinguish headers from rows

Change the background colors for the sales, customer, and product headers. We can modify the properties for all three items at once. Select all of those headers by holding down the Ctrl key and using your mouse to click the three labels that identify those headers. In the Properties section go the background properties and enter the value `#578FBD` (see Figure 5-98).



Outline:

- LABELFirstName
- LABELLastName
- LABELPersonnelNumber
- LABELeMailAddress
- LABELManager
- LABELCompany
- LABELAccountNumber
- LABELCRMNumber
- LABELDepartment
- LABELContactName
- LABELContactPosition
- LABELCompEmailAddress
- LABELCompPhoneNumber
- LABELSalesPersonInfo
- LABELCustomerInfo
- LABELProductInfo

Property	Value
General	
Appearance	
image	
imagemode	resize
justify	center
linespacing	0
border	off
visible	on
printvisible	on
fontinfo	11 pt Hel…
fontcolor	black
bgcolor	#578FBD
Red	87
Green	143
Blue	189
Name	Unknown
Transparent	off

Problems

0 errors, 0 warnings, 0 infos

Description	Resource	In Folder	Location

Figure 5-98 Change the background color for the table headers

Distinguish the table

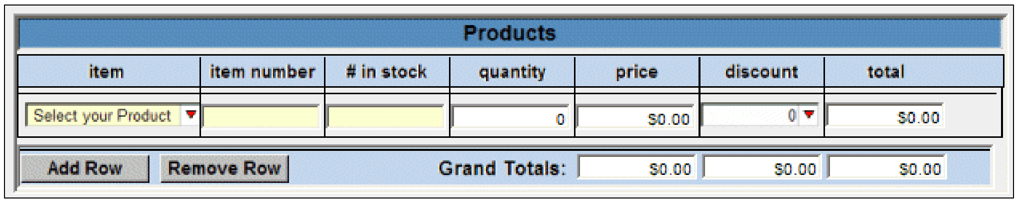
We are going to change the table to highlight a subheader and footer. We can use PANE1, which we created to contain the action buttons and total fields of our table, as the footer, but we need to add another item to the form to be the header.

Add subheader to table

Follow the steps below to add a subheader to the table:

1. Add a new box to the form using the Outline view to place the item inside the TABLEORDERDETAILS_PANE just below PANE1 in the build order.
2. Set the sid to BOXProductSubHeader.
3. Use absolute expand to set the size of BOXProductSubHeader equal to PANE1.
4. Use relative alignment to position our new box below the LABELProductInfo item.
5. Set the background color for our new subheader and the footer to #C2D7ED.

Preview the form to validate your changes and the positioning of the items in the table. When finished it should look like Figure 5-99.



Products

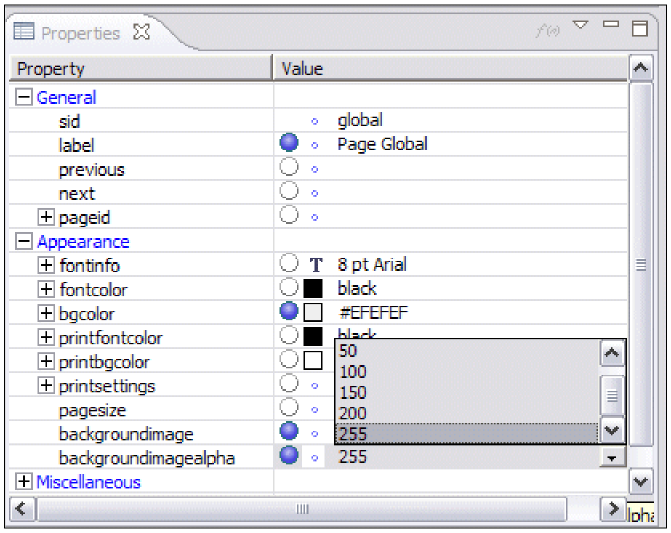
item	item number	# in stock	quantity	price	discount	total
Select your Product			0	$0.00	0	$0.00

Grand Totals: $0.00 $0.00 $0.00

Figure 5-99 Preview changes to table

Set page background color

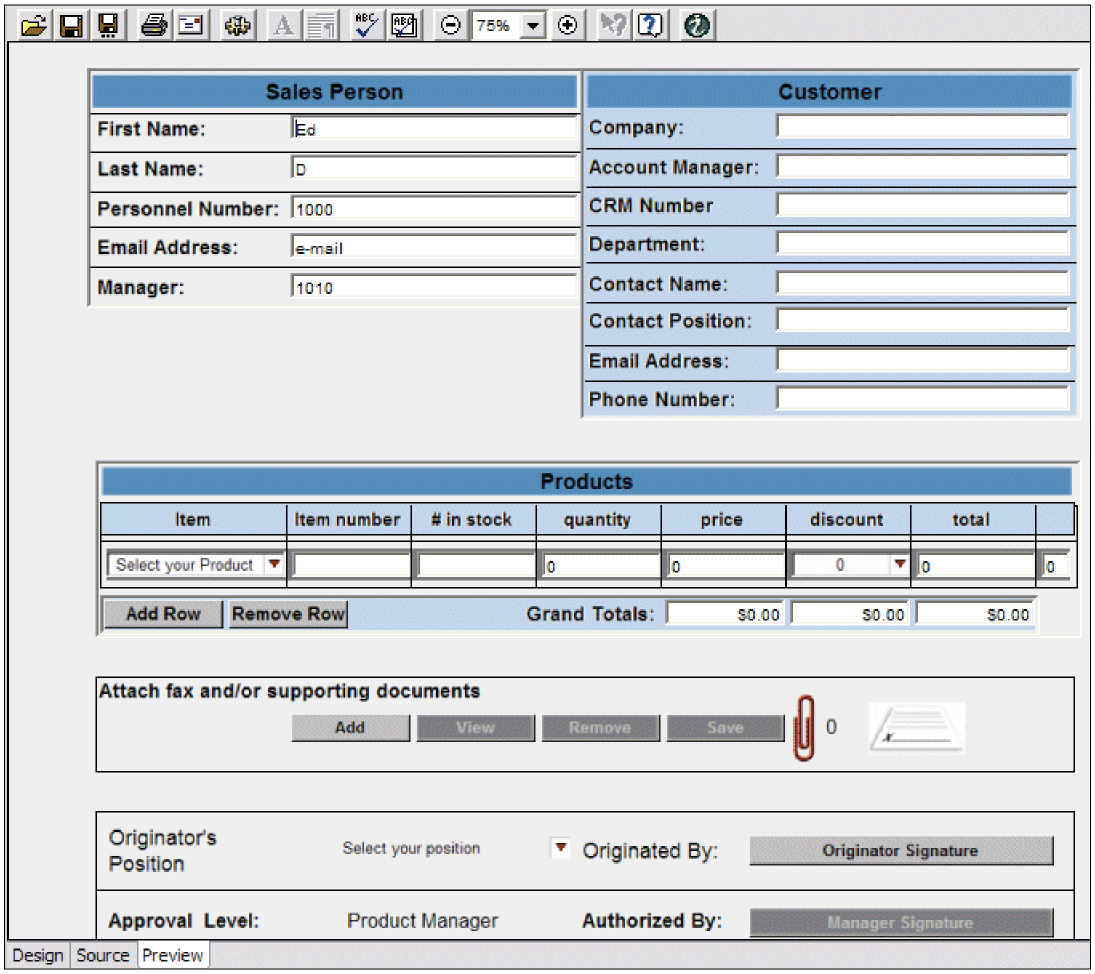
The last thing we change on the form page is the background color of the page. Set the background color for this page to this #EFEFEF, as shown in Figure 5-100.



Property	Value
General	
sid	global
label	Page Global
previous	
next	
pageid	
Appearance	
fontinfo	8 pt Arial
fontcolor	black
bgcolor	#EFEFEF
printfontcolor	black
printbgcolor	
printsettings	
pagesize	
backgroundimage	
backgroundimagealpha	255
Miscellaneous	

Figure 5-100 Make the background image invisible

When you are finished the form should look like Figure 5-101.



Sales Person	
First Name:	Ed
Last Name:	D
Personnel Number:	1000
Email Address:	e-mail
Manager:	1010

Customer	
Company:	
Account Manager:	
CRM Number	
Department:	
Contact Name:	
Contact Position:	
Email Address:	
Phone Number:	

Products

Item	Item number	# in stock	quantity	price	discount	total	
Select your Product			0	0	0	0	0
Add Row	Remove Row	Grand Totals:		$0.00	$0.00	$0.00	

Attach fax and/or supporting documents

Add View Remove Save 0

Originator's Position	Select your position	Originated By:	Originator Signature
Approval Level:	Product Manager	Authorized By:	Manager Signature

Figure 5-101 Enhanced layout completed

5.8 Toolbars

Toolbars allow you to place headings and control buttons on your forms so that they are always visible for users. Toolbars appear at the top of form pages when opened in the Viewer. They do not scroll with the rest of the form and are always visible to the user. This is especially useful if you have a number of buttons that you always want the user to be able to access, such as navigation and submit buttons, or if there is a title that always needs to be visible.

When the form is printed, the toolbar is omitted because it is not part of the printed area of the form. Therefore, it is most useful for items that do not or should not need to be printed, such as navigational buttons. Although you can add a toolbar to any page of your form, it is really only needed on the traditional form pages where you would not want to print toolbar items.

In this section we cover the following topics:

- Tips on setting up your toolbar.
- Create a toolbar.
- Add branding.
- Add form controls.
- Create toolbar object.

5.8.1 Tips on setting up your toolbar

Create a toolbar with all of the necessary buttons, images, and text that you need, then copy the toolbar and paste it onto the other traditional pages.

If you want to maintain a consistent look and feel of the toolbar without the overhead on the form wizard pages you can copy all of the items in the toolbar and paste them on the top of the wizard pages.

Make sure that your toolbar items are properly configured before you start working with them. For example, decide which buttons you need, such as a Print button, a Save button, a Submit button, and so on. Then use one button as the basis for aligning all the others relative to one another on the form.

Restriction: If the toolbar is larger than half the form window, it is necessary to scroll within the toolbar section to see everything it contains.

Copying a toolbar from one page to another

You can copy a toolbar, including all of the items in the toolbar, to another page. This is useful if you want to use the same toolbar on each page of your form.

To copy a toolbar to another page:

1. In the Outline view, expand the page containing the toolbar that you want to copy.
2. Select the toolbar.
3. Right-click and select **Copy**.
4. Select the page where you want to copy the toolbar.
5. Right-click and click **Paste**.

5.8.2 Create a toolbar

To insert a toolbar on the traditional form page, Page1, select the **Toolbar** item from the palette, as shown in Figure 5-102, and place it on Page1.

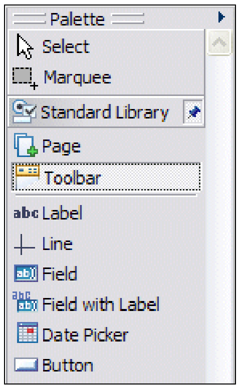
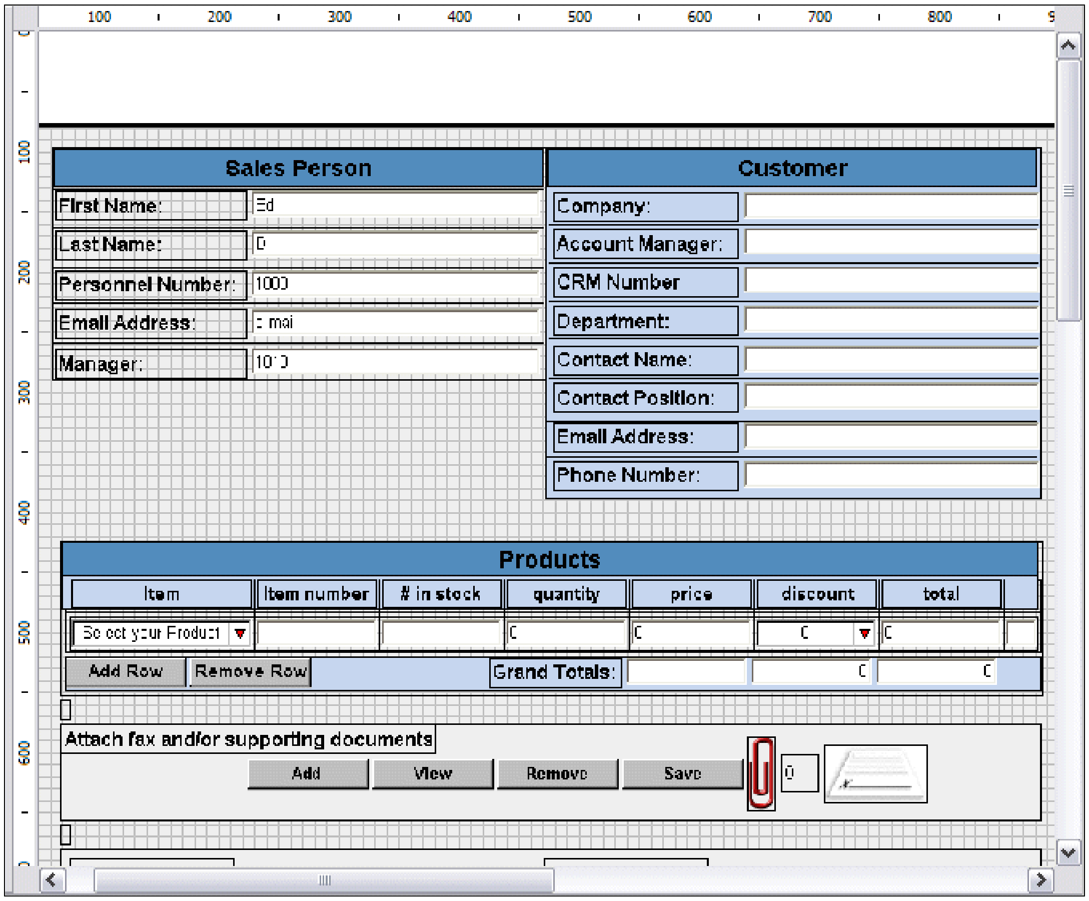


Figure 5-102 Select Toolbar from palette

The toolbar is automatically placed at the top of Page1, and the previously defined form items have all been pushed down, as shown in Figure 5-103.



Sales Person

First Name:	Ed
Last Name:	D
Personnel Number:	1000
Email Address:	: mai
Manager:	10`0

Customer

Company:	
Account Manager:	
CRM Number	
Department:	
Contact Name:	
Contact Position:	
Email Address:	
Phone Number:	

Products

Item	Item number	# in stock	quantity	price	discount	total
Select your Product			0	0	0	0

Add Row | Remove Row | Grand Totals: | | 0 | 0

Attach fax and/or supporting documents

Add | View | Remove | Save | 0

Figure 5-103 Add toolbar

Notice that our toolbar is not much more than empty white space. We need to add navigation buttons, form controls, and corporate branding to it. Navigational items allow the end user to navigate from one page to another when the form is previewed in the Designer or launched independently in the Viewer. We start by adding our branding to the toolbar and later add the following controls:

- Page navigation pop-up
- Save form to file system
- Print form
- E-mail form
- Show order ID
- Page back
- Page next

5.8.3 Add branding

Branding a form is just as important as branding a Web site or software product. Branding is especially important in a toolbar where it allows a company to maintain a presence in the minds of the form's end users. It reminds those users that their product, solution, or service is benefitting them. Branding is not just limited to logos. It should also include a consistent look and feel — from color selection, to font size and style, as well as a message or slogan. When designing a form, branding should be one of the first considerations.

Add the Redbooks logo

To add the Redbooks graphic go the Enclosures view, expand **Data** and **Resources**, then drag and drop the Redbooks logo image into the toolbar area. Use absolute alignment to position the image from its center to the left-most border of the sales person table, as shown in Figure 5-104.

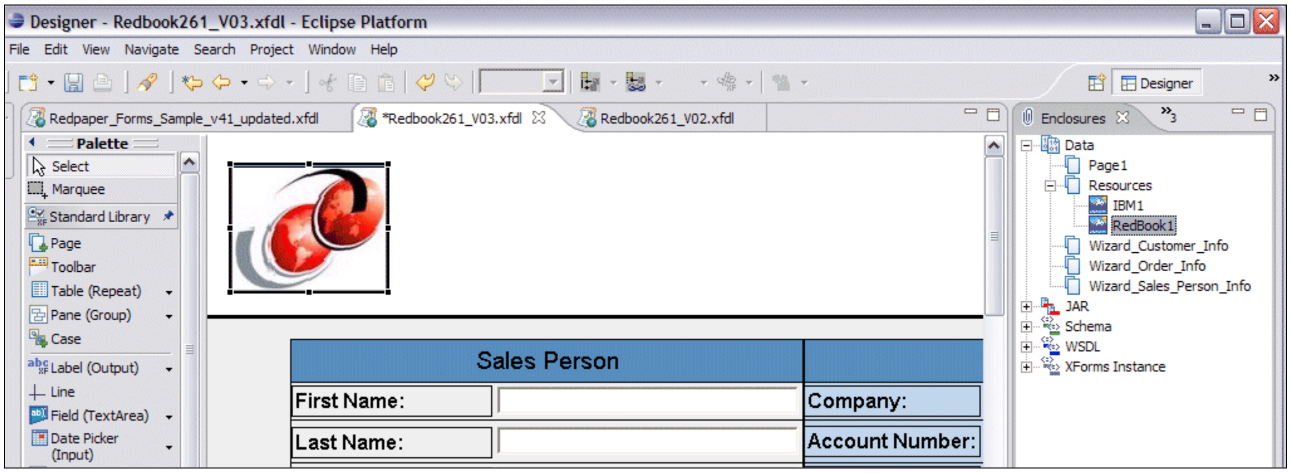


Figure 5-104 Add Redbooks graphic

Add borders

To set up and improve the layout of the toolbar, we add a header and footer to the toolbar. Use the steps below to add two boxes to the toolbar:

1. Select the box item from the palette.
2. Add it to the toolbar.
3. Set the sid equal to HeaderBox1.
4. Set the color of the box to #3E6CAA.
5. Use absolute alignment to set the box below the Redbooks graphic.
6. Use the absolute expand tool to extend the right most border so that it is equal to the right-most borders of the Customer table.

Repeat the steps to add a second box to the toolbar. The sid for this box is HeaderBox and it is placed above the Redbooks graphic.

Figure 5-105 shows the resulting modifications to the toolbar.

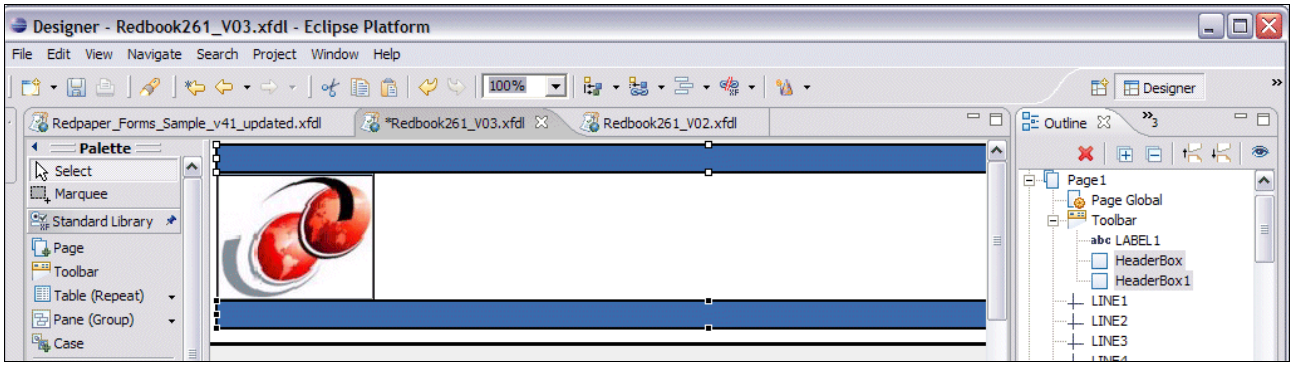


Figure 5-105 Add header and footer to the toolbar

Add IBM logo

Add the IBM Workplace Forms product logo from the Enclosures view. Use absolute alignment to align the IBM logo to the right-most border of the top header, and then use absolute alignment again to vertically align the center of the IBM logo to the center of the Redbooks graphic. When completed it should appear just like Figure 5-106.

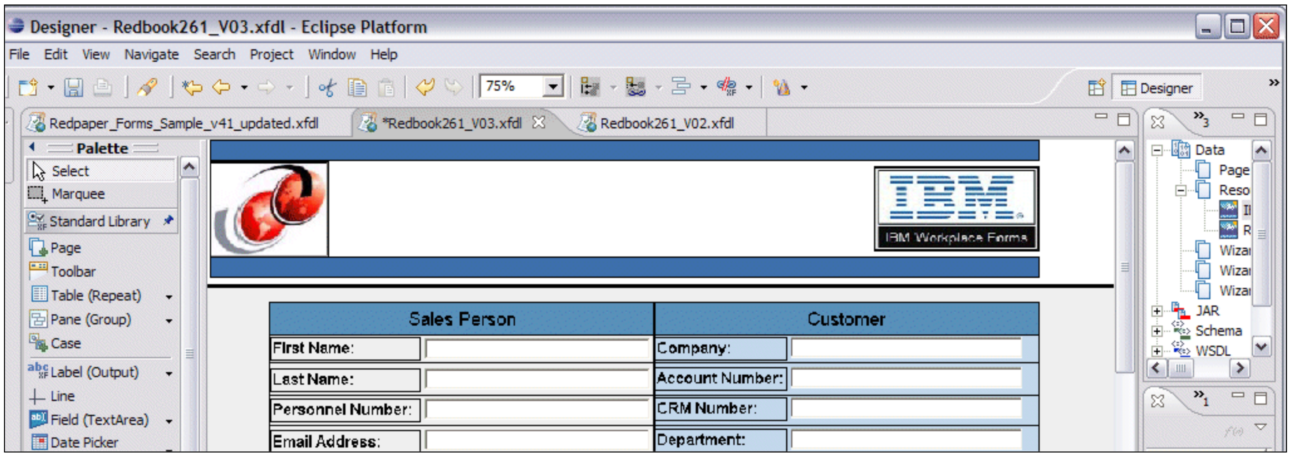


Figure 5-106 Add IBM logo

Add a header label

The toolbar contains a form title. To add the title to the toolbar follow the steps below:

1. Select a non-XForms label from the palette.
2. Add it to the toolbar.
3. Set the sid equal to LABELTitle.
4. Set the value equal to Product Price Quotation.
5. Set the fontinfo equal to 18 pt Arial (bold).
6. Use absolute alignment to align the center of the label vertically to the center of the Redbooks graphic.
7. Use absolute alignment to horizontally align the center of the label to the center of the sales person label.

When finished the toolbar should look like that shown in Figure 5-107.

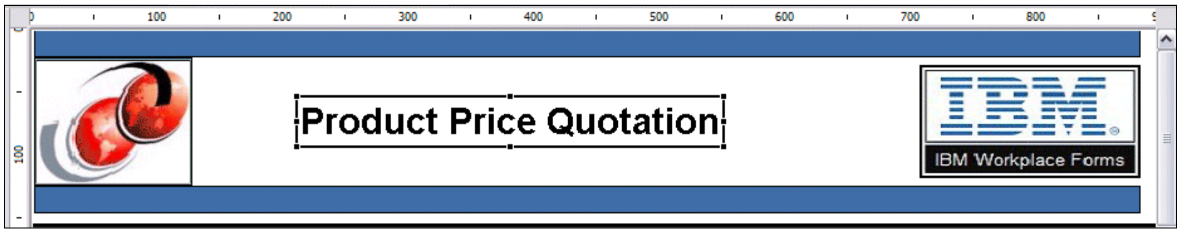


Figure 5-107 Add label to toolbar

5.8.4 Add form controls

Now that we have our layout for the toolbar, we can begin adding functionality to it. We need to add two sets of action items to the toolbar:

- The first set of toolbar items is standard form function buttons and an order identifier. These items include:
  - Save
  - Print
  - Email
  - Submit
  - Order ID
- The second set of items are navigation items. They include:
  - Next page
  - Previous page
  - Drop-down list of pages for direct navigation to any page in the form

In this section we cover the follow topics:

- Add form function controls.
- Add pages.
- Add navigation items.

Add form function controls

First, we add the command buttons that provide standard form functions. As we have done earlier, we create one button, define the look and feel, and then copy that button for reuse in the toolbar.

Define the Save button

Follow these steps to create the Save button:

1. Select a non-XForms button from the palette.
2. Add it to the toolbar.
3. Define the properties for the Save button, as shown in Table 5-20.

Table 5-20 Save button properties

Property	Value	Description
General → sid	BUTTONSave	Unique Identifier.
General → value	Save	Display zero (0) as value.
General → type	saveform	Save current form.
General → itemlocation → x → value	332	Set x coordinate. (This value may be different on your form.)
General → itemlocation → y → value	100	Set y coordinate.
General → itemlocation → alignvertc2c	HeaderBox1	Relative align after the HeaderBox1 item.
General → Appearance → fontinfo	7 pt Verdana® (bold)	Set the font type and size.
General → Appearance → justify	Center	Ensures that the string will be centered.

Property	Value	Description
General → Appearance → bgcolor	#3E6CAA	Default blue for the form.
General → Appearance → fontcolor	white	Set font color to white.
General → Appearance → border	off	Turn off border for the button.

Since this button is the template for the remaining buttons, you should preview the form to validate the form's look and feel. When you are finished the first button should look like that shown in Figure 5-108.

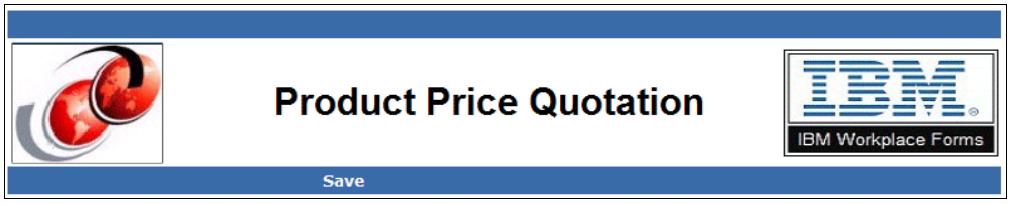


Figure 5-108 Add Save button

Define remaining function buttons

Copy the Save button, and paste three copies of it into the toolbar. Modify the properties for each item to match those shown in Table 5-21.

Table 5-21 Button properties

sid	Value	Item name	Type	Positioning
BUTTONPrint	Print	Print	print	Absolute after previous item
BUTTONeMail	Email	e-Mail	submit	Absolute after previous item
BUTTONSubmit	Submit	Submit	submit	Absolute after previous item

Since the alignment is dependent on the build order of the items, preview the form again to be sure that they are correctly applied (see Figure 5-109).

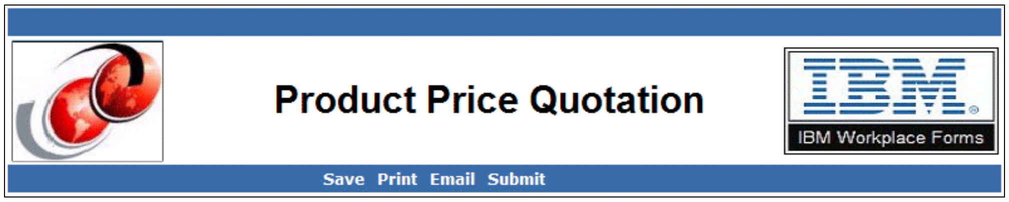


Figure 5-109 Additional buttons added to toolbar

Create order ID

We want to include an order ID field and label in the toolbar so that it is always visible no matter what page of the form is currently displayed. These toolbar items are tied to an element of an instance in the XForms Model. To create these items we use the instance data itself, as outlined in the steps below. The instance we use is FormOrderData. The element is ID.

1. Open the Instance view.

2. Drag and drop the ID element into the toolbar. This automatically creates two items:
   – A field element - ID1.
   – A label element - ID_LABEL1, which is relative aligned before ID1. Therefore ID1 is used to position our items in the toolbar.
3. Set the properties for the ID_LABEL1 item equal to those shown in Table 5-22.

Table 5-22 ID_LABEL1 properties

Property	Value	Description
XForms (output) → label → Text	Order ID	Displayed value for the label.
General → Appearance → fontinfo	7 pt Verdana (bold)	Set the font type and size.
General → Appearance → bgcolor	#3E6CAA	Default blue for the form.
General → Appearance → fontcolor	white	Set font color to white.
General → Appearance → border	off	Turn off border for the label.
General → Appearance → justify	Right	Ensures that the string will be right justified.

4. Use absolute alignment to place the ID1 field item before the IBM logo.
5. Use absolute alignment to align the top of the ID1 field item with the top of the BUTTONSubmit item in the toolbar.
6. Resize the width of the ID1 field so that the ID_LABEL1 item appears just after the BUTTONSubmit item.

Preview the form to validate your changes. When finished the tool bar should look like that shown in Figure 5-110.

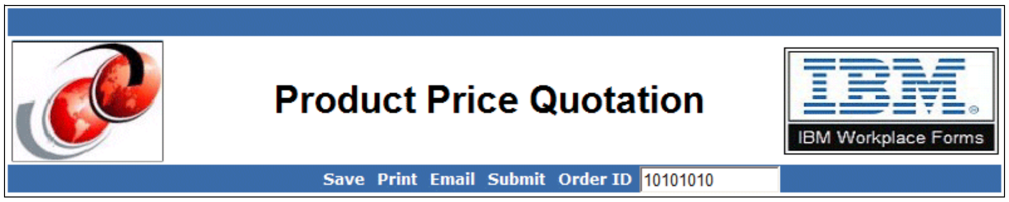


Figure 5-110 Order ID label and field added

Add pages

Before we can properly configure our navigation buttons in the toolbar, we need to add pages to the form. We need three additional form pages for our wizard pages. To add pages to the form select a page item from the palette and add it to the Outline view before PAGE1 in the build order. Set the sids for each page, as follows:

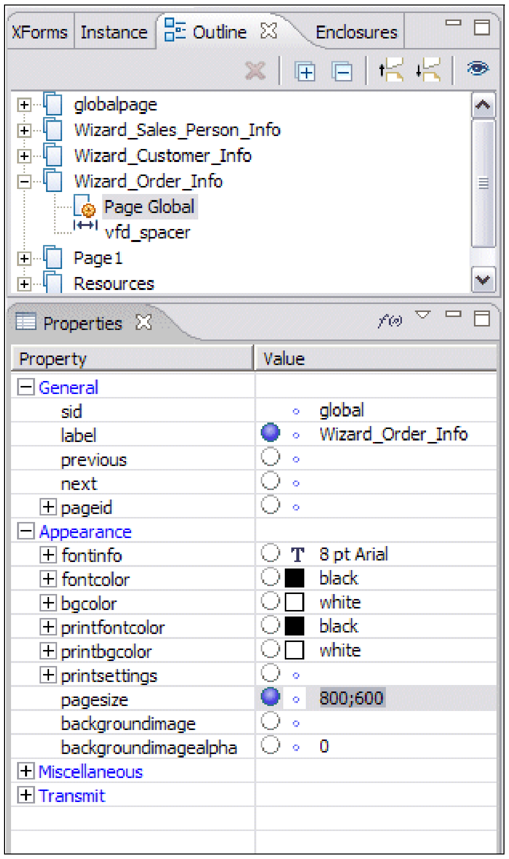
- Set the sid for the first wizard page to Wizard_Sales_Person_Info.
- Set the sid for the second wizard page to Wizard_Customer_Info.
- Set the sid for the second wizard page to Wizard_Order_Info.

Define global properties

After the three wizard pages are added to the form, open the Properties view for the *page global*.

Note: Page globals specify settings (such as Next and Save Format) and characteristics (like bgcolor) for the page within which they appear. Page globals appear within a global item at the top of each page definition, and apply to the whole page. They can be overridden by option settings within items.

Set the page size equal to 800;600 for all. In Figure 5-111 we show these settings for the third wizard page.



- globalpage
- Wizard_Sales_Person_Info
- Wizard_Customer_Info
- Wizard_Order_Info
  - Page Global
  - vfd_spacer
- Page1
- Resources

Property	Value
General	
sid	global
label	Wizard_Order_Info
previous	
next	
pageid	
Appearance	
fontinfo	8 pt Arial
fontcolor	■ black
bgcolor	□ white
printfontcolor	■ black
printbgcolor	□ white
printsettings	
pagesize	800;600
backgroundimage	
backgroundimagealpha	0
Miscellaneous	
Transmit	

Figure 5-111 Properties view of wizard page 3

Now that we have completed the addition of all of the pages that are required for the new form document, we can begin defining individual components for each page.

Add navigation items

With a multiple page form, it is necessary that you provide the end user with a means to navigate between pages. Without navigation items, or business logic to automatically redirect the user from page to page, the end user would only be able to access the first visible page of the form.

Providing navigation between pages

To allow the user to move from page to page when viewing your form in the Viewer, you need to add paging controls. You need to make the following decisions about paging in your form:

- Do you want the user to be able to navigate both forward and backward?

  Consider whether the user will try to page through the form initially to look at its scope, try to clarify a confusing instruction, or need to fix an error.

  For example, If the user enters something on page three that invalidates something on page one, the user will need to return to page one to fix the error. Otherwise, the Viewer will not allow the form to be submitted.

- Do you want to hide pages from the user?

  You may want to reformat the user's input for storage or printing on hidden pages in the form.

- Do you want to show different pages to different users, depending on what they enter into the form?

  You can program the form to decide where the user should go next, depending on what has been entered into the form.

  Note: If you do this, make sure to consider backward navigation as well.

- Do you want to direct the input focus to an item that is not the first item on a page?

  You can program a paging control to direct the input focus to particular items on new pages.

Add Previous and Next page buttons

To create the page navigation buttons, follow the steps below:

1. In the palette, select a non-XForms Button item.
2. Click in the toolbar to place the button on the page.
3. Set the properties to those shown in Table 5-23.

   Table 5-23 Previous page button

Property	Value (ref)	Description
General → sid	Prev_Page_Button	Unique Identifier.
General → value	<< Previous	Display string for the button.
General → type	pagedone	Switches to a different page in the form.
General → itemlocation → after	item previous	Place item after previous item in the build order. (This should be the ID1 field item.)
General → Appearance → fontinfo	7 pt Verdana (bold)	Set the font type and size.
General → Appearance → justify	Center	Ensures that the string will be centered.

4. Normally, the name of a page to display would be entered into the URL property for this button. However, for this form a compute is used with two custom options to determine the previous page. For now leave the URL property blank.

Tip: To direct the input focus to an item that is not the first item on the page, set url to #*PAGE0*.ITEM, where *PAGE0* is the name of the page to display and ITEM is the name of the item to direct focus to (for example, #PAGE3.FIELD2).

5. Repeat the previous steps to add a second button item to the form. This button is the Next page button. Set the properties for this item equal to those provided in Table 5-24.

Table 5-24 Next page button

Property	Value (ref)	Description
General → sid	Next_Page_Button	Unique Identifier.
General → value	Next >>	Display string for the button.
General → type	pagedone	Switches to a different page in the form.
General → itemlocation → after	item previous	Place item after previous item in the build order. (This should be the Prev_Page_Button button item.)
General → Appearance → fontinfo	7 pt Verdana (bold)	Set the font type and size.
General → Appearance → justify	Center	Ensures that the string will be centered.

Define computes for navigation items

Instead of defining static values to be used for the Previous and Next buttons on every page, we create a compute that functions in any page on any form. It makes a nice addition to the user object library for reuse in future form development efforts.

Previous page compute

Define two custom options for the Prev_Page_Button using the steps shown below:

1. Select the **Prev_Page_Button** in the Designer.
2. Go to the Source editor.
3. Insert the option definitions shown in Example 5-22 into the code for the Prev_Page_Button.

Example 5-22 Define custom options

```
<custom:page_prev xfdl:compute=" &#xA;
   custom:this_page->pageprevious"> &#xA;
</custom:page_prev>

<custom:this_page xfdl:compute=" &#xA;
   getReference('','','page') +. '.global'"> &#xA;
</custom:this_page>
```

4. Replace the URL entry for the button with the compute code shown in Example 5-23.

Example 5-23 URL compute

```
<url compute="'#' +. custom:page_prev"></url>
```

5. Save your changes and return to the Designer.

Next page compute

Define two custom options for the Next_Page_Button using the steps shown below:

1. Select **Next_Page_Button** in the Designer.
2. Go to the Source editor.
3. Insert the option definitions shown in Example 5-24 into the code for the Next_Page_Button.

Example 5-24 Define custom options

```
<custom:page_next xfdl:compute=" &#xA;
   custom:this_page->pagenext"> &#xA;
</custom:page_next>

<custom:this_page xfdl:compute=" &#xA;
   getReference('','','page') +. '.global'"> &#xA;
</custom:this_page>
```

4. Replace the URL entry for the button with the compute code shown in Example 5-25.

Example 5-25 URL compute

```
<url compute="'#' +. custom:page_next"></url>
```

5. Save your changes and return to the Designer.

Create combobox for direct page navigation

You could also provide paging controls using a popup, combobox, or a list. We use a combobox item to create the navigation item for this form.

Add cells to the Resources page

To do this:

1. Non-XForms comboboxes use cell items to represent the choices shown in its list. Since the combobox is used for navigation on all four form pages, the cells should be defined on the Resources page so that they do not need to be redefined on all of the form pages. Using the Outline view go to the Resources page.
2. Select a cell **(Non-XForms)** item from the palette.
3. Add the first cell to the Resources page.
4. Define the properties of the first cell as shown in Table 5-25.

Table 5-25 First cell properties

Property	Value	Description
sid	SalesInfoChoice	Unique identifier
value	Sales Information	Displayed value
group	SelectPage	Member to this group
type	pagedone	Switches to a different page in the form
url	#Wizard_Sales_Person_Info.global	Page identifier

5. Add the second cell to the Resources page.

6. Define the properties of the second cell as shown in Table 5-26.

Table 5-26 Second cell properties

Property	Value	Description
sid	CustomerInfoChoice	Unique identifier
value	Customer Information	Displayed value
group	SelectPage	Member to this group
type	pagedone	Switches to a different page in the form
url	#Wizard_Customer_Info.global	Page identifier

7. Add the third cell to the form.
8. Define the properties of the third cell as shown in Table 5-27.

Table 5-27 Third cell properties

Property	Value	Description
sid	OrderInfoChoice	Unique identifier
value	Order Info	Displayed value
group	SelectPage	Member to this group
type	pagedone	Switches to a different page in the form
url	#Wizard_Order_Info.global	Page identifier

9. Add the fourth cell to the form.
10. Define the properties of the fourth cell as shown in Table 5-25 on page 298.

Table 5-28 Fourth cell properties

Property	Value	Description
sid	TraditionalFormChoice	Unique identifier
value	Traditional Form	Displayed value
group	SelectPage	Member to this group
type	pagedone	Switches to a different page in the form
url	#Page1.global	Page identifier

Add navigational combobox to Page1

To do this:

1. Select a non-XForms combobox item in the palette.
2. Place the combobox item in the toolbar on Page1.
3. Define the properties for this item as shown in Table 5-29.

Table 5-29 Combobox properties

Property	Value (ref)	Description
sid	COMBOBOXSelectPage	Unique identifier.
value	Go To ...	Displayed value.

Property	Value (ref)	Description
group	Resources.SelectPage	Member to this group.
type	pagedone	Switches to a different page in the form.
General → itemlocation → width → value	228	Set width of value.
General → itemlocation → alignc2r	LABEL1	Align the center of this item with the right of the Redbooks logo.
General → itemlocation → alignvertc2c	HeaderBox1	Relative align after the HeaderBox1 item.
General → Appearance → fontinfo	7 pt Verdana (bold)	Set the font type and size.
General → Appearance → justify	Center	Ensures that the string will be centered.
General → Appearance → bgcolor	#3E6CAA	Default blue for the form.
General → Appearance → fontcolor	white	Set font color to white.

That completes the design of the toolbar for the form. Preview the form when finished to test the changes that we have made. When finished the toolbar will look similar to that shown in Figure 5-112.

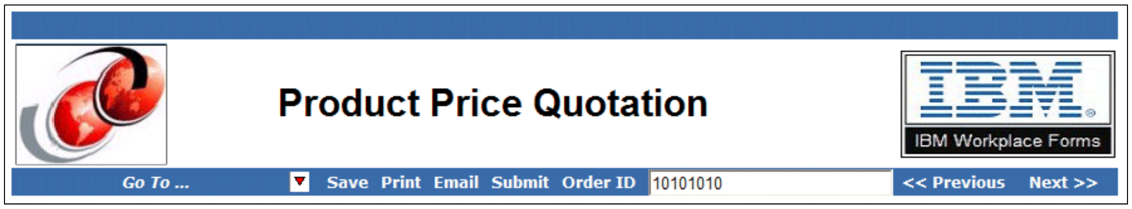


Figure 5-112 Toolbar complete

5.8.5 Create toolbar object

A toolbar is not required on the wizard pages but we want to maintain a consistent look and feel to our form. The solution is to reuse the items in our toolbar. We could select all of the items in the toolbar and then copy and paste them to all the wizard pages. However, another approach is to create a reusable object that includes all of these items.

To create the object follow the steps listed below:

1. Select all of the items in the toolbar. You can use either the Design canvas or the Outline view to select them all.

2. Right-click one of the selected items and choose **Export** from the list, as shown in Figure 5-113.

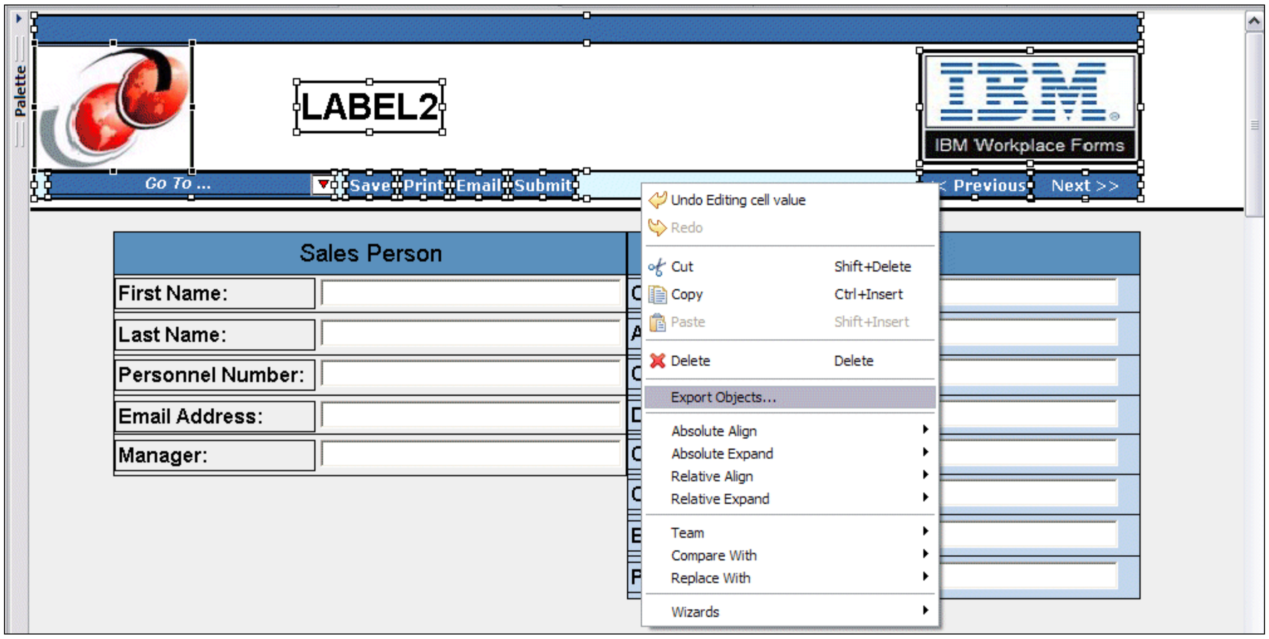
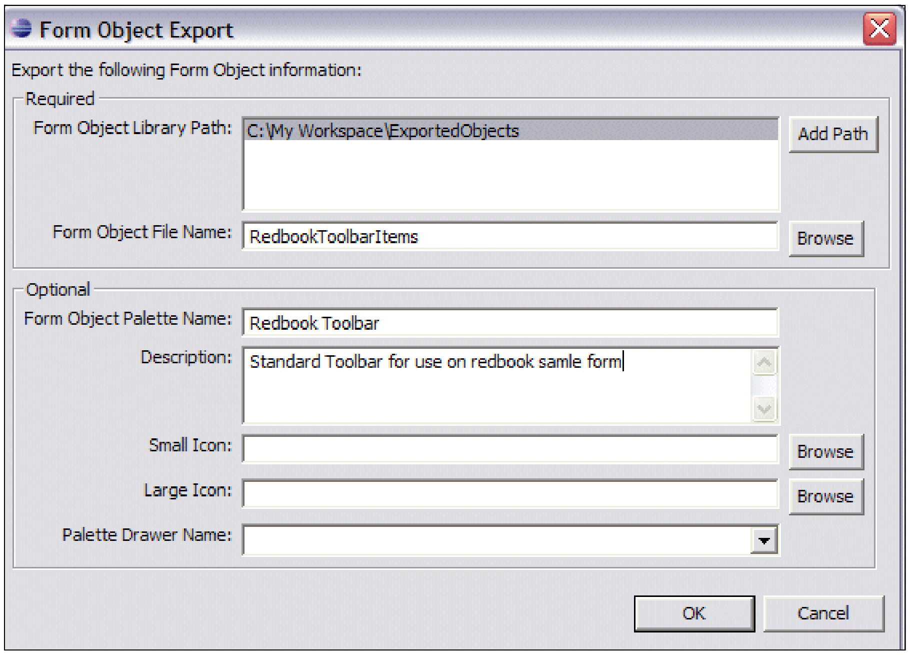


Figure 5-113 Export toolbar items

3. A window opens, as shown in Figure 5-114.


Form Object Export

Export the following Form Object information:

Required

Form Object Library Path: C:\My Workspace\ExportedObjects

Form Object File Name: RedbookToolbarItems

Optional

Form Object Palette Name: Redbook Toolbar

Description: Standard Toolbar for use on redbook samle form

Small Icon:

Large Icon:

Palette Drawer Name:

Figure 5-114 Form object export window

4. Provide a path where the object is exported to.
5. Enter `RedbookToolbarItems` as the form object file name.
6. As an optional step you can also define a unique name and description to be shown in the user object library of the Designer palette. We enter `Redbook Toolbar` for form object

palette name, and `Standard Toolbar for use on the redbook sample form` for the Description value.

7. The new object is added to the form palette in the user object library, as shown in Figure 5-115.

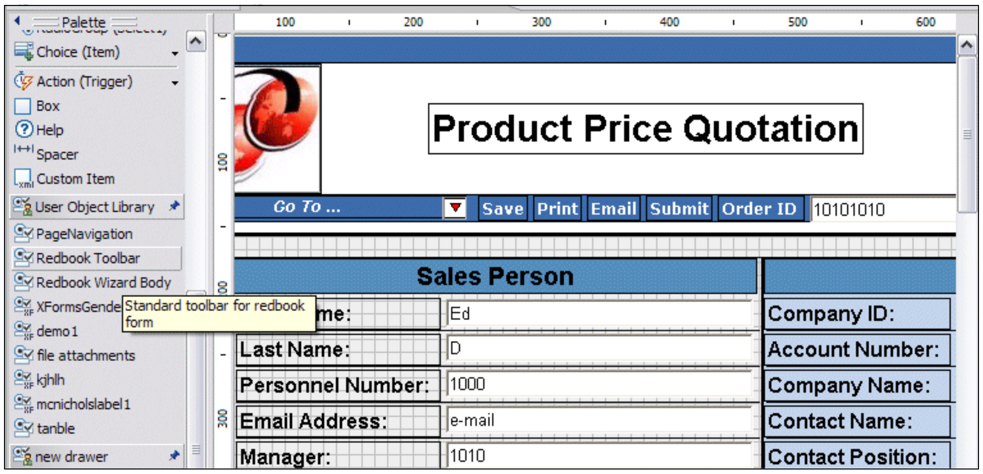


Figure 5-115 Exported object in palette library

Add toolbar object to wizard pages

Add the standard navigation and form items to the wizard pages. Using the Outline view go to each of the wizard pages and place the Redbooks toolbar object on the canvas of each page. Position the items at the top of the wizard pages, as shown in Figure 5-116.

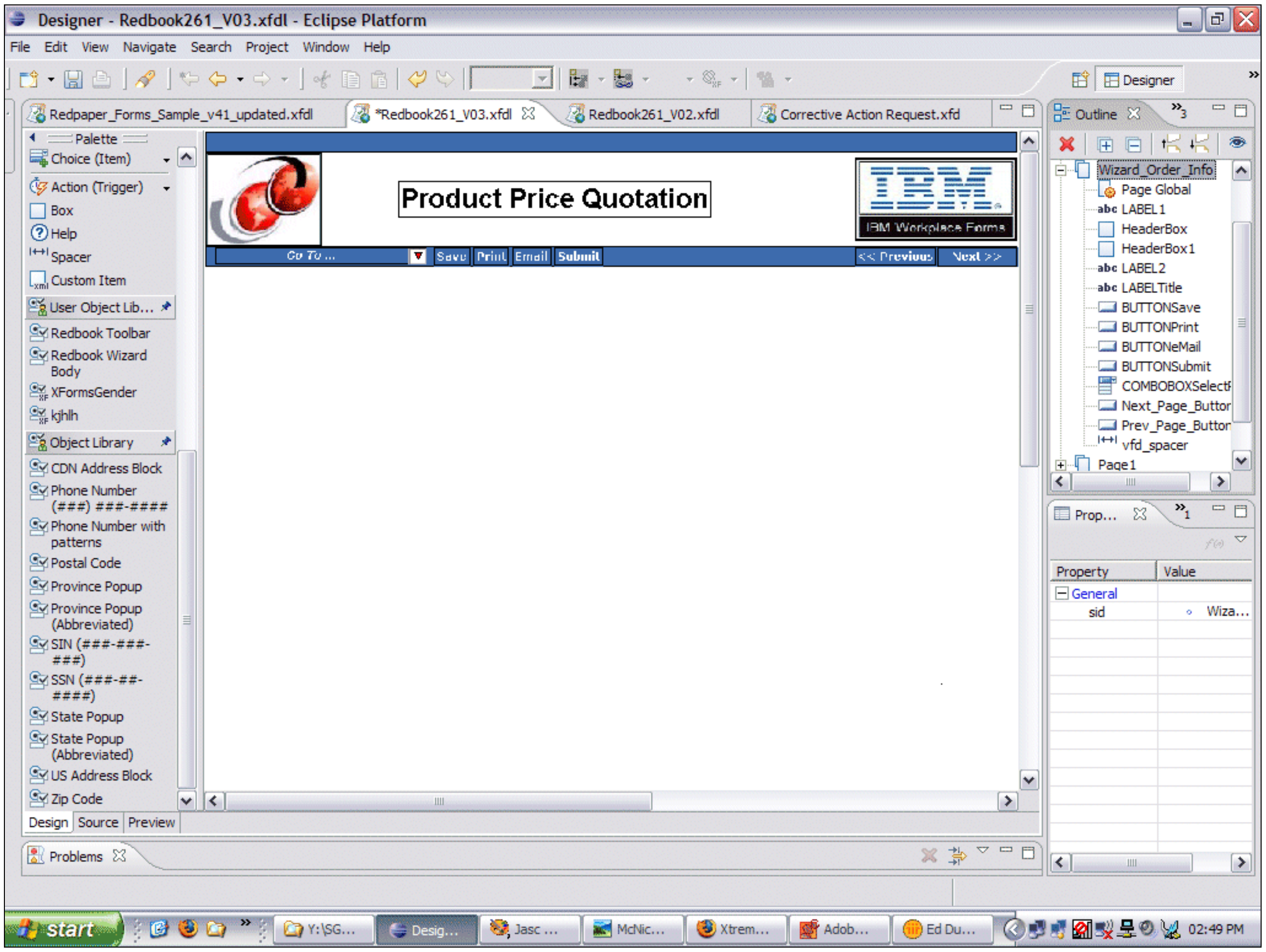


Figure 5-116 Toolbar items added to wizard page

Modify navigation buttons

We have built our form with five pages — four visible to the end user and one for common resources that should not be visible when the form is launched. However, if the Previous button is pressed when on the first visible page of the form (Wizard_Sales_Person_Info page), the Resources page is loaded, and the same is true if the Next button is pressed while on the last page of the form (Page1). Aside from the fact that the Resources page offers nothing of use to the end user, it creates an issue for them as well because there are no page navigation items available. In other words, if you navigate to the Resources page you cannot return to the other pages.

The solution is to modify the URL values for both of these pages, as shown in Table 5-30.

Table 5-30 Modify URL values for navigation buttons

Page	Navigation button	URL
Wizard_Sales_Person_Info	Prev_Page_Button	#Page1
Page1	Next_Page_Button	#Wizard_Sales_Person_Info

Preview the form and test the navigational elements of the new items.

5.9 Creating the layout for the wizard pages

A wizard page typically gets a resolution of 600x800 pixels. For our form we create three wizard pages to guide the user through the following information areas that are on the traditional form page that we just created:

- Sales representative
- Customer information
- Order information

In this section we cover the following topics:

- Considerations in advance
- Steps to build the wizard pages
- Setting up the toolbar
- Common layout items
- Adding input items to the wizard pages

5.9.1 Considerations in advance

In this section we discuss advance considerations.

Best practices for implementing traditional forms and wizard pages

A well-designed wizard page makes life easier for your users and helps to ensure that forms are filled out correctly. The following sections take you through some best practices and recommendations to consider as you venture into building the forms.

Step 1

Design and implement the traditional form first as we have done. This allows us to copy items from the traditional form to wizard pages after formatting the fields, preserving the format on the wizard pages and the bindings to the XForms Model. Here are some recommendations:

- Make sure that the field size is the same on the wizard page as on the traditional form and that it can hold the same amount of data proportionally, especially if using different fonts between the traditional form and the wizard page.
- If the format is different between the traditional form item and the wizard page item, the user may not be able to enter the required amount of data, or data entered on the wizard page may be truncated or invalid on the traditional form.
- Consider using a resources page to store reusable items that may be referenced on multiple pages in the form. For example, as shown in the layout above, we intend to have a consistent header across the top of all of our wizard pages. We can add those items to the resource page.

Step 2

Design the template for your wizard pages. A template typically consists of a page containing a sizing information, a background box (or two if you want a shading effect), a heading, and navigation buttons.

By using a template, you ensure that each wizard page has a consistent size, look, and feel. This also makes it much easier for you to create the individual wizard pages since the background and any buttons are done for you, and all you need to do in most cases is copy and paste the items from the traditional form onto your wizard pages.

Step 3

Make liberal use of help messages and have areas on the page to display help as opposed to only using tool tip help. As mentioned above, reference the same help message that the traditional form field references for ease of maintenance.

To do this, you can set up computes in labels to display the help messages within labels rather than simply as mouse-over tool tips. The best way to implement this is to have a single label item on each wizard page that makes use of the page global focused item option. This is essentially a pointer to whatever item currently has focus. You can then de-reference that item's help item value, and display that text in the label.

Step 4

Use the XForms Model to bind items on wizard pages to fields on the traditional form.

The basics of how to use the XML Data Model are covered in the Advanced XFDL documentation (either training guide or document) section titled "XML Data Model."

Using the XForms Model to make a wizard work is relatively easy. You need to create a data instance as part of the XForms Model containing one node for each piece of data that is represented in both the traditional form pages and the wizard. Then when you set up the bindings (you can do this easily in the Designer) you simply create two bindings for each node in the instance — one connecting the data entered in the wizard page and one connecting the data entered in the traditional form page. When the data in one form element changes, the data in the other element linked to that node in the XForms Model Instance is updated as well, so there is no need for computes pushing and pulling data in every form item.

Both XForms Models and XFDL have event-driven compute engines that can be used to manipulate a form. The XFDL language has been modified to serve as the presentation layer or *skin* off the underlying XForms Model. However, there are still several areas where these two implementations overlap each other. While designing a form you may be faced with several situations where you are unsure of which method is most appropriate, XFDL or XForms. A simple rule to follow is that any logic or behavioral effects that are dependant on business rules should be controlled by XForms, where possible.

Because XForms is relatively new there will be times when the language does not contain the necessary constructs required to produce a desired result. In these cases it is appropriate to use the functionality of XFDL to supplement XForms. Using XForms over XFDL procedures is also important if you are interested in exporting your XForms Model. Any logic that is defined using XForms binds will be included in the export procedure, which makes it much easier to implement the XForms Model with a different presentation layer (that is, XHTML).

Step 5

Break wizard pages down into common or logical sections and have the user enter the data in a logical order. Fields may not appear in an intuitive manner on the traditional form and it may make more sense to the user on the wizard page if the order is changed. Also, it may be effective to group items on the same wizard page when they are required on the traditional form under the same conditions. This wizard page could then be bypassed if the condition is not true and the data is not required.

Tip: Do not overcrowd wizard pages and make them too busy. This defeats the purpose.

Step 6

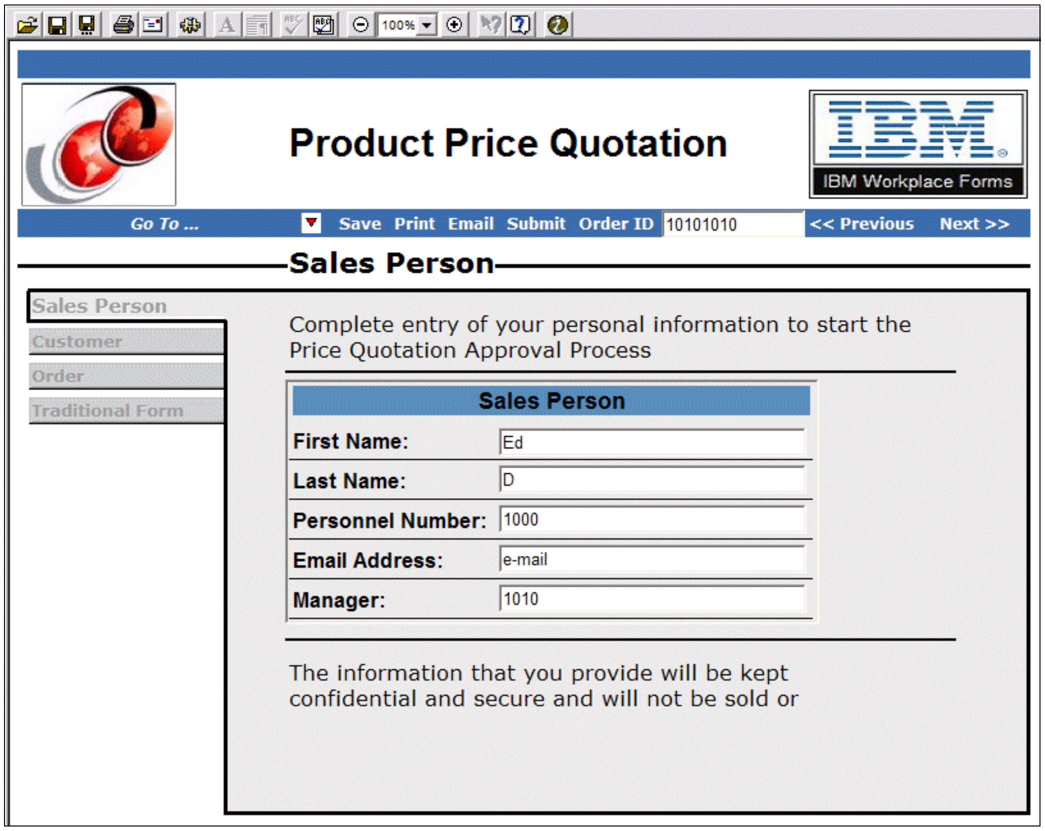
Decide whether your users will be allowed to exit the wizard pages before completing them and to save the data that they have already entered. As an alternative, you may want to give the user the opportunity to bypass the wizard pages altogether.

Attention: If you provide the opportunity to bypass the wizard pages, it is a good idea to let the user return to the wizard pages if she wishes. If you have a lot of wizard pages, the user will find it helpful to be returned to the last wizard page she was on rather than to be taken right back to the beginning. In order the achieve this, you need to set a global return-to option in your form that a Back to wizard button can use. This global option should be set whenever a user clicks a button that takes him or her to the traditional form, and should contain the page reference of that button.

5.9.2 Preview of Wizard page

The purpose of the wizard pages is to perform a guided interview for the user, which makes it a lot easier and more intuitive to fill out a complex form. The individual wizard pages break up the traditional form page into meaningful parts, and is used to lead the user through the data entry process in a logical and controlled manner.

The layout of the wizard pages is typically more graphical and user friendly than the layout of the traditional form pages. Figure 5-117 illustrates one of the wizard pages that we construct. The figure shows the first wizard page of our form, the Wizard_Sales_Person_Info page. Although all of the wizard pages request different information from the person filling in the form, they all have the same look and feel. It is important to always consider providing some consistent elements from page to page to give the user a sense of familiarity.



Order ID: 10101010

Complete entry of your personal information to start the Price Quotation Approval Process

Sales Person	
First Name:	Ed
Last Name:	D
Personnel Number:	1000
Email Address:	e-mail
Manager:	1010

The information that you provide will be kept confidential and secure and will not be sold or

Figure 5-117   Sales representative data

Common layout items

In order to provide a consistent look and feel to our wizard pages and reduce form design time, we need to identify any common items that can be reused on all of the wizard pages. If we strip out the data-specific elements from the wizard page, the resulting layout would look like the page illustrated in Figure 5-118.

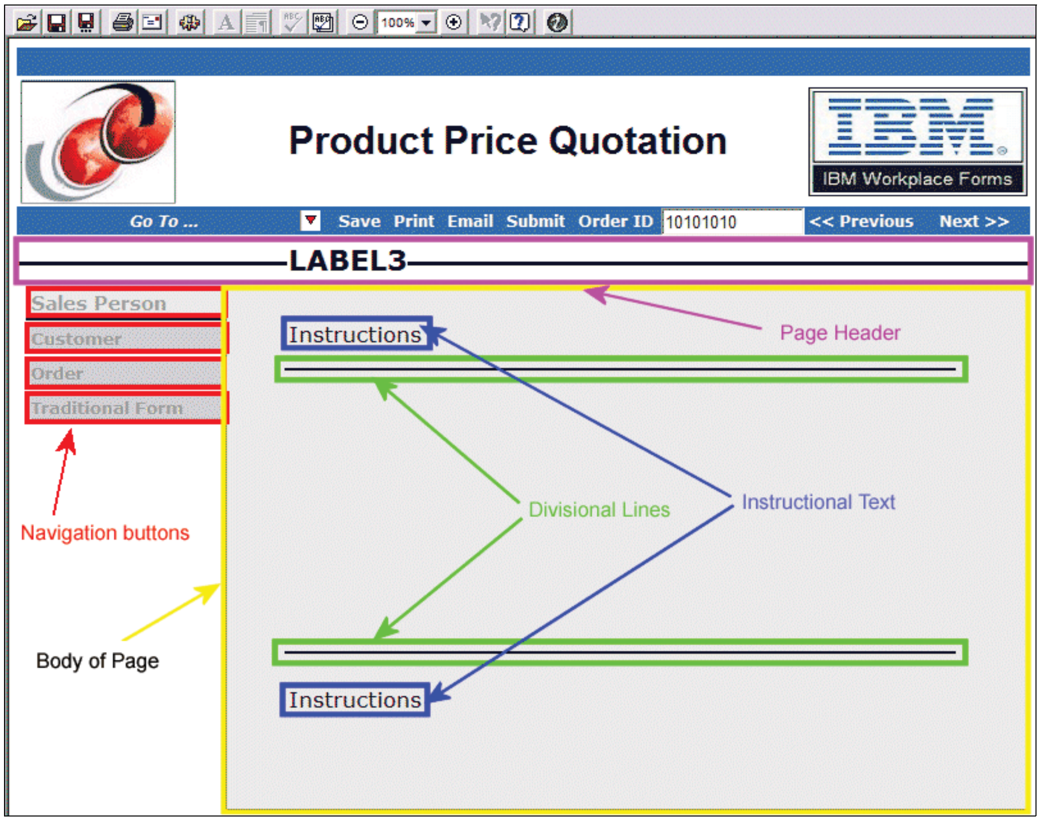


Figure 5-118 Common wizard Items

When we break this image down ever further we identify the following form items.

- A page header with label and divider line (purple).
- A box to identify the body of the page (yellow).
- Instructional text areas (blue).
- Four direct navigation buttons designed to appear as if they were tabs (red).
- Lines are added to outline the box and active button. Doing this helps to support the appearance of buttons as tabs and provides a visual indicator to the end user.

If we design this basic layout using the items just identified then we can export the items collectively as one object for reuse on the other wizard pages. In the next section we do just that when we create the wizard template.

5.9.3 Wizard template

In the previous section we identified five primary components that need to be recreated. In this section we add those items to the Wizard_Sales_Person_Info page of the form. Since many of the steps necessary to recreate the wizard template of the form have already been covered in prior sections of this chapter, here we take a different approach. Figure 5-119 shows a clean example of the wizard template.

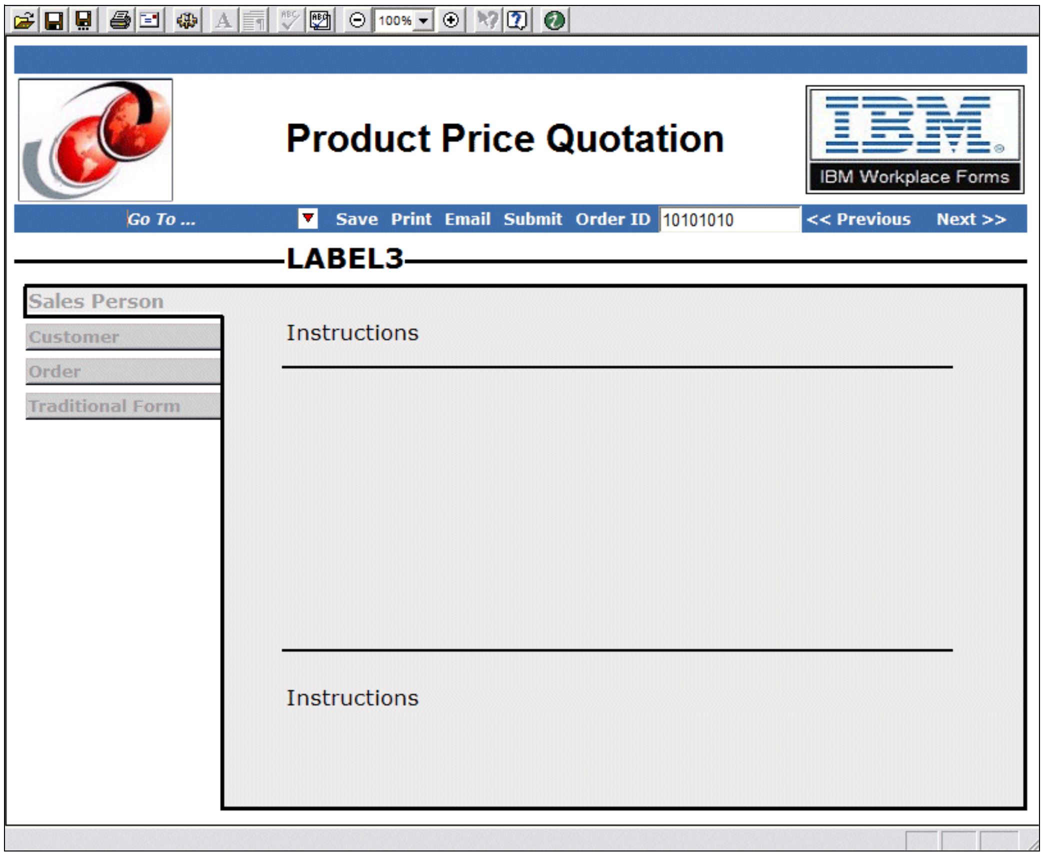


Figure 5-119 Wizard template completed

Using the skills learned earlier in this chapter and in Chapter 2, "Features and functionality" on page 19, recreate the area as shown above.

Tips: Here are some tips that may be helpful:

- Guide lines, rulers, and grids are key to the item layouts.
- Start building the form the top of our list and work your way down.
- When building the page header, place the line before the label in the build order.
- Set the header label background color to white to give the appearance that there are two lines surrounding the label.
- The main box should precede the navigation buttons in the build order.
- Look closely at the buttons. The navigation button that directs you to the current page is lighter in color than the other buttons. It has the same background color as the box. This is done to simulate tabs.
- Use lines to surround the box and the button that would normally navigate to the current page. In fact, it does not even need to be active.
- Although it may not be apparent now, the use of relative alignment definitions should be used for those lines since the box will likely have to expand or contract in height at least when we add the table to the Wizard_Order_Info page.
- When defining the navigation buttons, use explicit URL values to call the desired page (see Example 5-26).

Example 5-26 Explicit URL value for navigation button

```
<url>#Wizard_Sales_Person_Info.global</url>
```

- Use the compute shown in Example 5-27 to define the font color for the navigation buttons.

Example 5-27 Fontcolor compute for navigation buttons

```
<fontcolor compute=" &#xA;
   (mouseover == 'on' ? '170' : '159') &#xA;
   +. ',' +.(mouseover == 'on' ? '51' : '159') &#xA;
   +. ',' +.(mouseover == 'on' ? '0' : '159') &#xA;
   ">159,159,159</fontcolor>
```

When finished, preview the form to make sure that the layout is precise. These items are used to create the template for the other two wizard pages when you are satisfied.

Place wizard template on remaining wizard pages

We can select all of these design items for the wizard layout and export them for use as one object.

1. Select items.
2. Export items as one object to our user object library in the Designer palette.
3. Place the wizard template object on each of the remaining wizard pages.

The look and feel of the navigation buttons will need to be updated on the other two pages.

5.9.4 Copy items from Page1

Earlier in this chapter we recreated three data sections from the original form: the sales person section, the customer details section, and the order details section. We copy those items from Page1 of the form and place them on the appropriate wizard page.

Note: Since the process is exactly the same for each section and respective page we illustrate the necessary steps for the first section and page only.

Sales person information page

To copy this form section to the Wizard_Sales_Person_Info page follow the steps outlined below:

1. All of the items that make up this form section are now contained in a single pane. Use the Outline view to select the **SalesPane** item.
2. Right-click and select **Copy**, as shown in Figure 5-120.

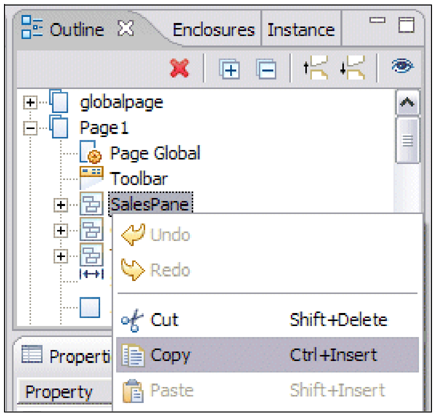


Figure 5-120 Copy sales person section

3. Use the Outline view to navigate to the first page of the form, the Wizard_Sales_Person_Info page.
4. After the page loads, right-click anywhere in the design canvas and paste the section on the form, as shown in Figure 5-121.

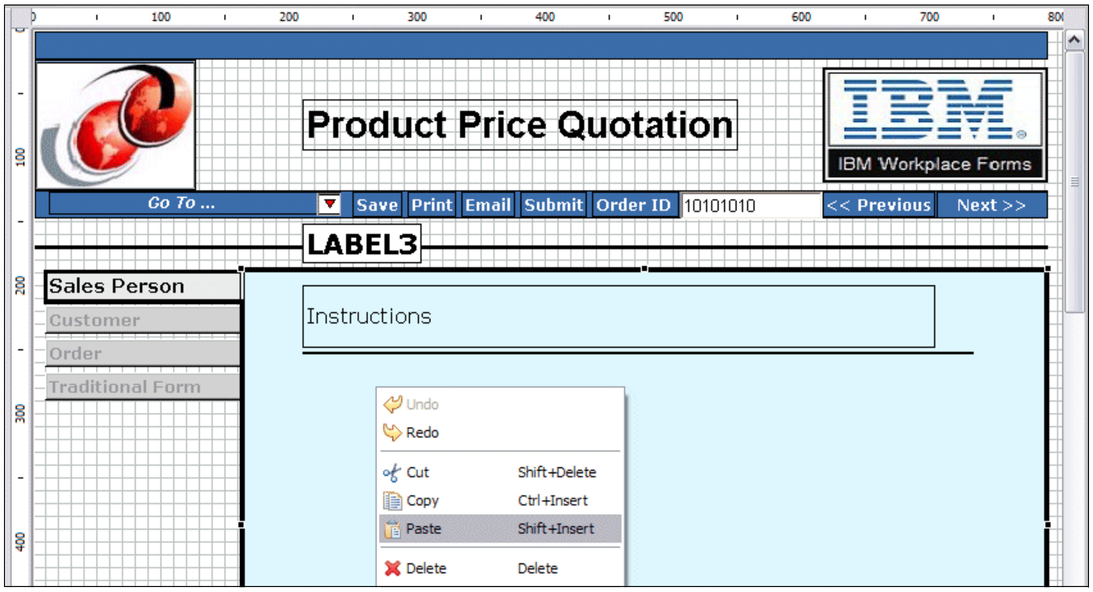


Figure 5-121 Paste sales person pane

5. Reposition the sales pane and all of the items it contains inside the mainBox item between the lines and Instruction labels.
6. Save your changes and preview the form.

Repeat the process outlined above for the other two sections and their respective pages.

Tips: Here are some tips that may be helpful:

- Use guide lines, rulers, and grids to position the sections.
- Remember that spacer items can provide a great solution when positioning items.
- Remember to use relative positioning for any items on the Wizard_Order_Info page that are positioned lower than the table.
- Wizard pages are smaller than Page1, therefore you will have to resize the labels and fields of the table so that the table will fit on the smaller page. Take advantage of the relative positioning rules to accelerate the resizing process.
- Be aware of the references, sids, and relative positioning rules when copying items from one page to another. It is possible to inherit attributes from Page1 that may not be valid on the wizard pages. For example, you must change the sid value for the TABLEORDERDETAILS_TABLE and replace any references to the original sid.
- Preview you changes and test the functionality of the form as you go. Once you have confirmed that a change is working appropriately be sure to save your changes.
- At this level of form development it may be more efficient at times to work directly in the Source editor.

5.10 Add signatures and business logic to the form

Earlier in the form design process we were not able to complete signature functionality and business logic definitions because the form was incomplete. Now that the we have all of the form items defined and in place we can add these advanced functions to the form.

There are three signatures and, depending on the status of the form with regard to the business rules, from one to all three of these signatures may be required. This means that after the first signature we still need some form functionality in order for the remaining signatures, XForms Model Binds, XFDL computes, and form navigation to work. To accomplish this we need to define filters that prevent those form elements from being signed and locked. In this section we outline how to create the signature functions.

5.10.1 Clickwrap signatures

Clickwrap signatures are used for this form. Clickwrap signatures are electronic signatures that do not require digital certificates. While they still offer a measure of security due to an encryption algorithm. Clickwrap signatures are not security tools. Instead, Clickwrap signatures offer a simple method of obtaining electronic evidence of user acceptance to an electronic agreement. The Clickwrap signing ceremony authenticates users through a series of questions and answers, and records the signer’s consent. Clickwrap style agreements are frequently found in licensing agreements and other online transactions. Simply put, Clickwrap signatures gather some information about you and then create a signature that contains that information. For example, a Clickwrap signature might prompt you to specify any or all of the following information:

- Your name.

- Personal information, such as your mother's maiden name that can be used to verify your identity.
- Repeat a statement to show that you agree with the document you are signing.

After you provide requested information, it is then included in the signature itself, and cannot be changed unless the signature is completely removed. Clickwrap signatures provide the same tamper proofing as other signatures, but do not identify the signer as reliably as other signature types. However, they also do not require any additional infrastructure, such as a PKI system or Signature Pad hardware.

Electronic signatures versus encryption

Electronic signatures essentially lock the data on a form so that it is obvious when tampering occurs. Tampering with the signed data causes the signature to break, which lets you know that you should not trust the document. Electronic signatures do not encrypt the data on a form in any way. They do not prevent people from reading the information. In fact, this would defeat the purpose of the signature, which is to indicate agreement with the information provided.

Important: If encryption is a concern, you must take other measures, such as implementing SSL security on your Web site, or creating a Viewer extension that encrypts the form before it is submitted.

5.10.2 Signature filters

Forms are frequently signed by more than one person. For example, some forms include a For Office Use Only section that requires an additional signature by one of the staff processing the form, in addition to the person submitting the form. In these cases, the office worker must be able to enter more information in the unsigned portion of the form and then add their own signature. The Product Price Quotation form we are creating is very similar.

Signature filters specify which parts of the form a particular signature signs. This means that you can create one signature that signs the entire form, or one that only signs the first portion of the form, and then a second signature that signs the second portion of the form.

Note: By, default, if you specify a signature button on a form and do not include any signature filters, the entire form is signed.

There are certain form items that you should always exclude from signatures. For example, when you click a Submit button, the triggeritem option is automatically set, recording the name of the button that triggered the submission. However, if a signature is applied to the triggeritem option, the Viewer is unable to update the option correctly.

In general, you should always exclude the following form elements from a signature:

- The triggeritem option
- The coordinates option
- Any portion of the form that subsequent users will change
- Subsequent signatures and signature buttons
- The signature item that stores the information for the signature you are creating.

Types of filtering

When creating a signature button that signs part of a form, there are two ways that you can control what the signature button will and will not sign:

- Keep filtering: Specify the items that the button will sign, leaving the rest of the form unsigned.
- Omit filtering: Specify the items that the button will not sign, making the rest of the form signed.

A form is more secure if you use omit filtering. By omitting only the items that you do not want signed, you ensure that you do not accidentally exclude items that should be signed, and prevent malicious users from adding to the form's contents without breaking the signature.

If you use keep filtering, the signature button should only be used to sign another signature that uses omit filtering.

Signature filter properties

Complex forms frequently require sophisticated filtering that you can set up by editing the following signature properties directly. Signatures can include any number filters.

Note: When using signatures, regardless of the signature filters in use, the following rules and guidelines apply:

- The mimedata option in a signature item is always omitted from the signature that item represents.
- The mimedata option in a data item that stores a signature image (see the signatureimage option) is always omitted from the signature that image represents.
- When using signatures you should omit navigational items to allow future users to navigate and review the form.
- If multiple signatures are included and the form still needs to provide business logic or calculations before the final signature, then they you will need to omit the model binds or form items that include XFDL computes needed to complete the form.

Signature filters are applied with an order of precedence so that filter properties are always processed in a consistent manner. A list of signature properties is provided below. The signature wizard allows us to set these properties in a user-friendly interface. The properties can also be defined and modified through the Source editor and the Properties view of the signature button when the advanced properties are shown for that view. Table 5-31 lists the behavior of the filter properties and the order in which the Viewer applies them.

Table 5-31 Filter behavior

Order	Property	Behavior if using the omit filter	Behavior if using the keep filter	Notes
1	signinstance	Omits only data in the indicated instance; throws them out.	Keeps only data in the indicated instance; throws others out.	
2	signnamespaces	Omits only elements and attributes in the namespaces indicated; throws them out.	Keeps only elements and attributes in the namespaces indicated; throws others out.	An element is kept if any of its children are kept, even if it is in the wrong namespace.
3	signitems	Omits only the types listed. Omitted items are not signed.	Keeps only the types listed. All other types are not signed.	

Order	Property	Behavior if using the omit filter	Behavior if using the keep filter	Notes
4	signoptions	In the items that remain (not omitted by signitems), omits all listed options. Omitted options are not signed.	In the items that remain, keeps all indicated options. All other options remain unsigned.	
5	signpagerefs	Omits the specified pages. Overrides settings in signitems and signoptions.	Keeps the specified pages. Respects settings in signitems and signoptions.	Omitted pages are not completely deleted. The page sid is preserved.
6	signdatagroups and signgroups	Omits the items in that group, even if they are of a type that should be kept according to a signitems setting.	Keeps the items in that group, even if they are of a type that should not be kept according to a signitems setting.	These settings override those in signpagerefs.
7	signitemrefs	Omits the specified items and overrides previous settings.	Keeps the specified items and overrides previous settings. Respects settings in signoptions.	These settings override signitems, signgroups, signpagerefs, and signdatagroups.
8	signoptionrefs	Omits the specified options, overriding any previous settings.	Keeps the specified options, overriding any previous settings. If the item containing the option has been omitted, that item's sid and the specified option are preserved.	This option's setting overrides all other filter options.

5.10.3 Define the Clickwrap signature buttons

To introduce you to the features available to define and maintain signature buttons we use a few different methods. In the examples below we use the Signature wizard to define the basic settings for our buttons, and then use the Properties view of the Designer to create the signature filters.

Attention: When working with the Signature wizard a bug was discovered. It prevented us from using the item picker within the wizard to select multiple items from different pages.

Thus, we found that we could only use the wizard for our form when simpler signature filters were required with omissions from a single page, or if we knew the form items well enough that we were comfortable using the node explorer to select our items.

Create omit signature button

Follow the steps below to define this Clickwrap signature button with omissions.

1. Right-click the **Originator's** button on Page1.
2. Select **Wizard** → **Signature Wizard**.
3. On the first page you have the opportunity to define a signature that signs the entire form or just parts of the form. For our form, we do not want to sign the entire form. Select **Parts of the Form**.
4. On the second page we have the opportunity to create an omit or a keep filter. As mentioned earlier, omit filters are more secure. Select **Items not to Sign** to create an Omit filter.

5. On the third page of the wizard we can select whole page items not to sign.

   Note: If you choose to omit an entire page you also omit all of the items contained on that page, which are all part of the presentation layer. However, any XForms data instances that may be referenced on that page are not automatically included in that filter. You must filter the data instances specifically.

   We do not want to exclude any pages from our signatures. Click **Next**.
6. On the fourth page we have the ability to use the node explorer window to select individual items that we want to exclude from our signature. For the purposes of our example, we are going to manually define these using the Properties view. Click **Next** to skip this page.
7. The fifth page allows us to specify the type of signature we are going to use. Select **Clickwrap** and click **Next**.
8. The sixth and final page allows us to define up to five safe guard questions used to authenticate users, and records the signer's consent. Our example does not require any safe guard questions. Click **Finish** to exit the wizard.

Create keep signature buttons

Follow the steps below to define the last two buttons using keep filters as overlapping filters to our omission signature.

1. Right-click the **ManagerSignatureBUTTON** item.
2. Select **Wizard** → **Signature Wizard**.
3. Select **Parts of the form** and click **Next**.
4. Select **Items to sig** and click **Next**. We define the filter using the Properties view for this button.
5. Click **Next** on the following two pages of the wizard.
6. Select **Clickwrap** for the type of signature and click **Finish**.
7. Repeat the previous steps for the OfficerSignatureBUTTON item.

Define properties for filters

In this section we define the filters for the three buttons in our form. The first button, OriginatorSignatureBUTTON, is the most robust so we use it as our example.

Define omit filter

Follow the instructions below to set the filter properties for this button.

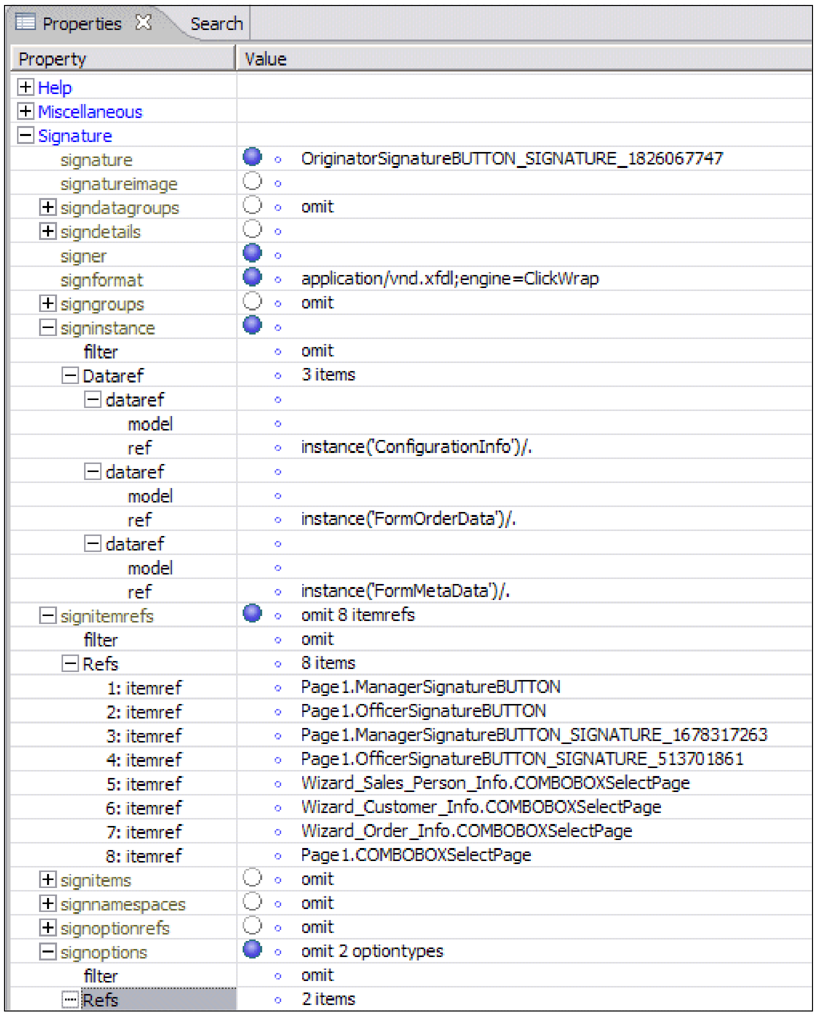
1. Click the **OriginatorSignatureBUTTON** item in the design canvas.
2. Go to the Properties view for the selected button.
3. By default, the Properties view only shows the most commonly used properties and does not show less commonly used, or advanced, properties. If not shown, click the down arrow menu button in the top right corner of the Properties view and then select **Show Advanced Properties**.
4. Towards the bottom of the Properties view you see the Signature section in blue text. Expand this view. Notice that some of these options have already been set because we used the wizard to get us started. These options include:
   – signature: This value is generated by the Signature wizard and it contains a signature and the data necessary to verify the authenticity of a signed form. The signature item contains an encrypted hash value that makes it impossible to modify the form without

changing the hash value that the modified form would generate. The value set for our form is OriginatorSignatureBUTTON_SIGNATURE_1826067747, but it will be different for the form you are creating.

  - signformat: sets the details of the signature, including the mimetype to encode it, the signature engine to create it, and special settings for the signature engine. For our form the signformat is equal to application/vnd.xfdl;engine=ClickWrap.
  - signoptions: Specifies which types of options are filtered for a particular signature. Filtering options means keeping or omitting all options of a particular type, rather than specific options. By default the following options are omitted when creating any signature type (omit or keep) with the wizard:
    - triggeritem: Sets in the form globals to identify which action, button, or cell activated a form transmission or cancellation. (Omits navigation and signature buttons from the signature.)
    - coordinates: records the position of the mouse pointer on an image.
  - signer: is enabled. Denoted by the blue circle. It is automatically generated and records the identity of the person who signed the form. The setting of the signer option varies according to the engine type used.

5. In addition to the signature options shown above we need to omit the remaining navigational items. Every page of this form includes a combobox item that provides direct navigation to any page in the form via the combobox's list. The **signaitemrefs** option allows us to specify individual items to be filtered for a this signature. Follow the steps below to filter these items from the signature.
   a. Expand the **signitemsrefs** option in the Signature section of the Properties view.
   b. The filter type should be set to omit based on our choices in the Signature wizard.
   c. In the Refs row, use the add (+) action button to add four references for the items we want to omit.
   d. Enter the references for your buttons. The references for the form we create are listed below:
      - Wizard_Sales_Person_Info.COMBOBOXSelectPage
      - Wizard_Customer_Info.COMBOBOXSelectPage
      - Wizard_Order_Info.COMBOBOXSelectPage
      - Page1.COMBOBOXSelectPage
6. The only other items we need to exclude from this first signature have to do with the other signature buttons. If we do not exclude these items from the first signature, then the second and third signature buttons would be locked. To omit the other two buttons from this signature follow the steps below:
   a. Expand the **signitemsrefs** option in the Signature section of the Properties view.
   b. The filter type should be set to omit based on our choices in the Signature wizard.
   c. In the Refs row, use the add (+) action button to add four references for the items we want to omit.
   d. Enter the references for your buttons. The item references for the form we created are listed below:
      - Page1.ManagerSignatureBUTTON
      - Page1.OfficerSignatureBUTTON
      - Page1.ManagerSignatureBUTTON_SIGNATURE_1678317263
      - Page1.OfficerSignatureBUTTON_SIGNATURE_513701861

When finished the signature properties for the form should look similar to those shown in Figure 5-122.



Property	Value
⊞ Help	
⊞ Miscellaneous	
⊟ Signature	
signature	● OriginatorSignatureBUTTON_SIGNATURE_1826067747
signatureimage	○
⊞ signdatagroups	○ omit
⊞ signdetails	○
signer	●
signformat	● application/vnd.xfdl;engine=ClickWrap
⊞ signgroups	○ omit
⊟ signinstance	●
filter	omit
⊟ Dataref	3 items
⊟ dataref	
model	
ref	instance('ConfigurationInfo')/.
⊟ dataref	
model	
ref	instance('FormOrderData')/.
⊟ dataref	
model	
ref	instance('FormMetaData')/.
⊟ signitemrefs	● omit 8 itemrefs
filter	omit
⊟ Refs	8 items
1: itemref	Page1.ManagerSignatureBUTTON
2: itemref	Page1.OfficerSignatureBUTTON
3: itemref	Page1.ManagerSignatureBUTTON_SIGNATURE_1678317263
4: itemref	Page1.OfficerSignatureBUTTON_SIGNATURE_513701861
5: itemref	Wizard_Sales_Person_Info.COMBOBOXSelectPage
6: itemref	Wizard_Customer_Info.COMBOBOXSelectPage
7: itemref	Wizard_Order_Info.COMBOBOXSelectPage
8: itemref	Page1.COMBOBOXSelectPage
⊞ signitems	○ omit
⊞ signnamespaces	○ omit
⊞ signoptionrefs	○ omit
⊟ signoptions	● omit 2 optiontypes
filter	omit
⊟ Refs	2 items

Figure 5-122 Signature properties

Define keep filters

Since the first signature locks everything on the form except navigational elements and the additional signature buttons, we can use keep filters to sign the remaining items.

Use the steps below to define the keep filter for the ManagerSignatureBUTTON item:

1. Expand the **signitemsrefs** option in the Signature section of the Properties view.
2. The filter type should be set to keep based on our choices in the Signature wizard.
3. In the Refs row, use the add (+) action button to add one reference for the item we want to keep.
4. Enter the references for the OriginatorSignatureBUTTON item. The item reference for the form we created is:

   ```
   Page1.OriginatorSignatureBUTTON
   ```

5. Repeat the previous steps to define the keep filter for the OfficerSignatureBUTTON item using Page1.ManagerSignatureBUTTON as the item reference.

Active state

The Manager and Officer buttons are not always active. The manager signature button should only be active if the originator signature has been provided. Add the following code to the ManagerSignatureBUTTON item in the form:

```
<active compute="OriginatorSignatureBUTTON.signer != '' ? 'on' : 'off'">on</active>
```

The Officer Signature button should only be active if the Manager Signature has been provided. Add the following compute to the active property of the OfficerSignatureBUTTON item in the form:

```
<active compute="ManagerSignatureBUTTON.signer != '' ? 'on' : 'off'">on</active>
```

Update form data

When the signatures are provided using the buttons just defined, some basic data needs to be recorded in support of the business logic of the form, and for later backend system integration.

Originator signature

The key information for this signature, and other form objects, is stored in the Form Meta Data XForms Model instance, as shown in Example 5-28.

Example 5-28 Form Meta Data and FormOrderData instances

```
<!-- Form Meta Data.  Some values set at design-time and others are set at
runtime.  See comments. -->

<xforms:instance id="FormMetaData" xmlns="">
   <FormMetaData>
      <FileName>SalesOrderDetails</FileName> <!-- Populated at design time -->
      <Version>0</Version>                   <!-- Populated at design time -->
      <CreationDate></CreationDate>          <!-- Populated at time of request -->
      <CompletionDate></CompletionDate>   <!-- Populated at submission -->
      <State>1</State>                       <!-- Populated during runtime -->
      <PreviousState>0</PreviousState>       <!-- Populated during runtime -->
      <Owner></Owner>                        <!-- Populated during runtime -->
   </FormMetaData>
</xforms:instance>
.....
<!-- Order Data.  Information about this specific order including approvals and
timestamps.-->
   <xforms:instance id="FormOrderData" xmlns="">
      <FormOrderData>
         <ID>10101010</ID>
         <CustomerID></CustomerID>
         <Amount>0</Amount>
         <Discount>0</Discount>
         <SubmitterID></SubmitterID>
         <State>1</State>
         <CreationDate></CreationDate>
         <CompletionDate></CompletionDate>
         <Owner></Owner>
         <Version>0</Version>
         <Approver1></Approver1>
         <AppovalDate1></AppovalDate1>
         <Approver1Comment></Approver1Comment>
         <Approver2></Approver2>
         <AppovalDate2></AppovalDate2>
         <Approver2Comment></Approver2Comment>
         <Cost></Cost>
         <StateDisp></StateDisp>
         <OriginatorRole></OriginatorRole>
      </FormOrderData>
   </xforms:instance>
```

If we look closely at this FormMetaData instance, you can see that each line is commented. The first two elements, file name, and version, are populated at design time. The third and last elements, creation date and owner, are set each time the form is signed. (The other elements are covered later in this chapter.) To set a value for these two elements we need to add a custom compute to the XFDL buttons.

The logic we use is as follows. When the originator button is pushed, check to see whether it is signed. (Remember that a signature can be declined or removed using the signature function.) If it is signed, then set the submitter ID value equal to the employee ID, which was provided in the sales person section of the form, and set the creation date equal to the current date. Otherwise, set the submitter ID is equal to nil (''). The code sample for this logic is shown in Example 5-29.

Example 5-29 Set submitter ID and creation date

```
<!-- Set the value for Approval comment if signed -->

<custom:SetSubmitterID xfdl:compute=" &#xA;
   toggle(signer) == '1' &#xA;
      ? (signer != '' &#xA;
         ? (set('SUBMITTERID1.value', &#xA;
            get('instance(\'EmployeeDetails\')/Employee/ID', '', 'xforms')) &#xA;
               + set('instance(\'FormMetaData\')/Owner', &#xA;
                  get('instance(\'EmployeeDetails\')/Employee/ID', &#xA;
                     '', 'xforms'), '', 'xforms') &#xA;
               + set('instance(\'FormMetaData\')/CreationDate', &#xA;
                     date(), '', 'xforms')) &#xA;
            : (set('SUBMITTERID1.value', '')  &#xA;
            ) &#xA;
         ) &#xA;
      : ''">
</custom:SetSubmitterID>
```

Inspecting this code we can see, we do not set the value for SubmitterID in the FormOrderData instance directly. We apply it to a hidden helper field. This field is bound to the instance element.

Example 5-30 Hidden XForms field on PAGE1.SUBMITTERID1 accessed in the first signature button

```
      <field sid="SUBMITTERID1">
         <xforms:input ref="instance('FormOrderData')/SubmitterID">
            <xforms:label></xforms:label>
         </xforms:input>
         <scrollhoriz>wordwrap</scrollhoriz>
         <itemlocation>
            <x>180</x>
            <y>845</y>
            <width>163</width>
         </itemlocation>
         <visible>off</visible>
         <bgcolor>#FF0000</bgcolor>
         <printvisible>off</printvisible>
      </field>
      <label sid="SUBMITTERID_LABEL1">
```

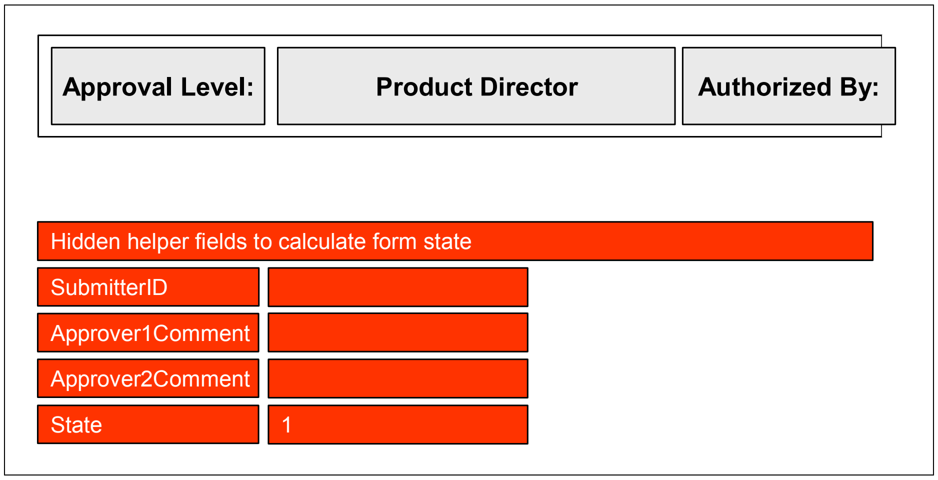


Figure 5-123 Hidden (red) fields for SubmitterID, approver comments, and form state

This is a work around for an actual product limitation. Setting a value directly in an XForms instance using the set xfdl function would not fire an event to run all binds wired to the changed value. So we set a xforms field value referencing the target element in the xforms instance. This will cause the XForms engine to run the related binds. The work around allows us to store the business logic in an xforms bind. Details to the business logic are discussed later in this chapter. For now we can make sure that whenever we change the submitterID field value with a button, the XForms engine will fire all binds relaying on the value behind the SUBMITTERID1 field.

Using the values for your form, add the logic represented above to the Originator's signature button.

Manager and officer signatures

Additional logic is required by the form logic for the manager and officer signatures. For the purposes of our form and the back-end system integration, we only need to record one value. These two buttons are used primarily as a means to approve sales based on the form thresholds. We record the interaction in the Order Data XForms Model instance (shown in Example 5-31).

Example 5-31 Order Data instance

```
<!-- Order Data.  Information about this specific order including approvals and
timestamps.-->

<xforms:instance id="FormOrderData" xmlns="">
   <FormOrderData>
      <ID>10101010</ID>
      <CustomerID></CustomerID>
      <Amount>0</Amount>
      <Discount>0</Discount>
      <SubmitterID></SubmitterID>
      <State>1</State>
      <CreationDate></CreationDate>
      <CompletionDate></CompletionDate>
      <Owner></Owner>
      <Version>0</Version>
      <Approver1></Approver1>
      <AppovalDate1></AppovalDate1>
      <Approver1Comment></Approver1Comment>
      <Approver2></Approver2>
      <AppovalDate2></AppovalDate2>
      <Approver2Comment></Approver2Comment>
      <Cost></Cost>
      <StateDisp></StateDisp>
   </FormOrderData>
</xforms:instance>
```

The logic that is applied to our buttons is the same. We use the Manager Signature button for our example shown in Example 5-32. The logic translates to when the manager signature button is pressed. Check to see if there is a signature. If there is a signature then set the Approver1 comments to OK, or else set it to nil (‘’).

Example 5-32 Approval logic

```
<!-- Set the value for Approval comment if signed -->

         <custom:SetCommentApprover1 xfdl:compute=" &#xA;
           toggle(signer) == '1' &#xA;
               ? (signer != '' &#xA;
                  ? set('APPROVER1COMMENT1.value', 'OK')  &#xA;
                  : set('APPROVER1COMMENT1.value', '')  &#xA;
                  ) &#xA;
              : ''">
         </custom:SetCommentApprover1>
```

The same logic can be used for the Officer Signature button, but be sure to modify it to update the APPROVER2COMMENT1 value instead of APPROVER1COMMENT1.

Attention: The FormOrderData instance has additional elements that can be updated at this point, but they are not required for the form logic or system integration. If you would like to update these elements, the previous two code samples can be used to map the values, as shown below:

```
<Approver1> = Manager ID
<AppovalDate1> = Current date at time of Manager signature
<Approver2> = Officer ID
<AppovalDate2> = Current date at time of Officer signature
```

5.10.4 Business logic

There are three signature buttons on Page1 of the form — one for each of the roles (originator (sales person typically), manager of the originator, director level signature). The three signatures allows role-based users to provide approval when needed for the sales quote form. Approval requirements are based on the amount of the sales quote.

Quote thresholds

There are two thresholds amounts, $10,000.00, and $50,000.00 (see Example 5-33), that are defined in the BusinessRuleParameters of the XForms Model in this form. They are used to determine whether a higher level signature is required to approve the order request.

Example 5-33 Upper and lower bounds

```
<!-- Business Rule Parameters -->

<xforms:instance id="BusinessRuleParameters" xmlns="">
   <BusinessRuleParameters>
      <BusinessRuleParams>
         <QuoteLevelOneThreshold>10000</QuoteLevelOneThreshold>
         <QuoteLevelTwoThreshold>50000</QuoteLevelTwoThreshold>
      </BusinessRuleParams>
   </BusinessRuleParameters>
</xforms:instance>
```

Define state

The business rule parameters for form state are applied in the following manner to define four different form states:

- State 1: If an originator signature is required, then the form state is one.
- State 2: If a manager signature is required, then the form state is two.
- State 3: If an officer signature is required, then the form state is three.
- State 4: If all required approval is provided, then the form state is four.

These states cannot be assigned based on thresholds alone. We must also consider existing signatures. This logic is executed in the form of a model bind, shown in Example 5-34. Consider the checks in place for setting the form state to two. The model bind checks to see whether the originator has signed, but the manager has not, and that the total cost is greater than or equal to the level one threshold.

Example 5-34 XForms Model bind - calculate state

```
<!-- business model (calculate the state based on amount, thresholds and existing
signatures-->

<xforms:bind calculate="&#xA;
   if(instance('FormOrderData')/SubmitterID = '', &#xA;
      '1', &#xA;
   if(instance('FormOrderData')/SubmitterID != '' and  &#xA;
      instance('FormOrderData')/Approver1Comment ='' and &#xA;
      instance('FormOrderData')/Amount >= &#xA;
      instance('BusinessRuleParameters')/BusinessRuleParams/QuoteLevelOneThreshold , &#xA;
      '2', &#xA;
   if(instance('FormOrderData')/SubmitterID != '' and &#xA;
      instance('FormOrderData')/Approver1Comment !='' and &#xA;
      instance('FormOrderData')/Approver2Comment ='' and &#xA;
      instance('FormOrderData')/Amount >= &#xA;
       instance('BusinessRuleParameters')/BusinessRuleParams/QuoteLevelTwoThreshold, &#xA;
      '3', &#xA;
      '4'))) &#xA;
   " id="calculateState" nodeset="instance('FormOrderData')/State &#xA; "></xforms:bind>
```

Use the logic shown in Example 5-34 to apply the form logic to your form.

Note: This bind evaluates the form state based on the available signatures. The existence of a signature is detected here based on filled instance elements SubmitterId, Approver1Comment, and Approver2Comment. The related values are set when pressing one of the signature buttons. The buttons set xforms field values referencing the instance elements evaluated in the bind. Setting the values in the instance directly from the button would not activate the created bind. Setting it via an xforms field will do the job.

User feedback

We need a way to inform the user of the next steps (signatures) required based on form state. To do this we add a new XForms Output Label to the form. The new label is positioned below the attachment section and above the signature section on the right side of the page layout. The we create a bind that checks the state and, based on the state value, returns the appropriate string (see Example 5-35 for details). Note that if no state is set then the feedback is that the form is in *draft* state.

Example 5-35 XForms Model bind - calculate display value

```
<!-- business model (calculate the display value for the current state -->

<xforms:bind calculate="&#xA;
   if(instance('FormOrderData')/State = '1', 'Requires Submitter Signature', &#xA;
   if(instance('FormOrderData')/State = '2', 'Requires Manager Signature', &#xA;
   if(instance('FormOrderData')/State = '3', 'Requires Director Signature', &#xA;
   if(instance('FormOrderData')/State = '4', 'Approved', &#xA;
      'Draft')))) &#xA;
      " id="setStateDisplayValue &#xA;
      " nodeset="instance('FormOrderData')/StateDisp &#xA;
"></xforms:bind>
```

5.11 Building the servlet

In the following section we show you how to build a servlet.

5.11.1 Where we are in the process: building stage 1 of the base scenario

Figure 5-124 is intended to provide an overview of the key steps involved in building the base scenario. This focuses on building the form, the servlet, and the JSPs.

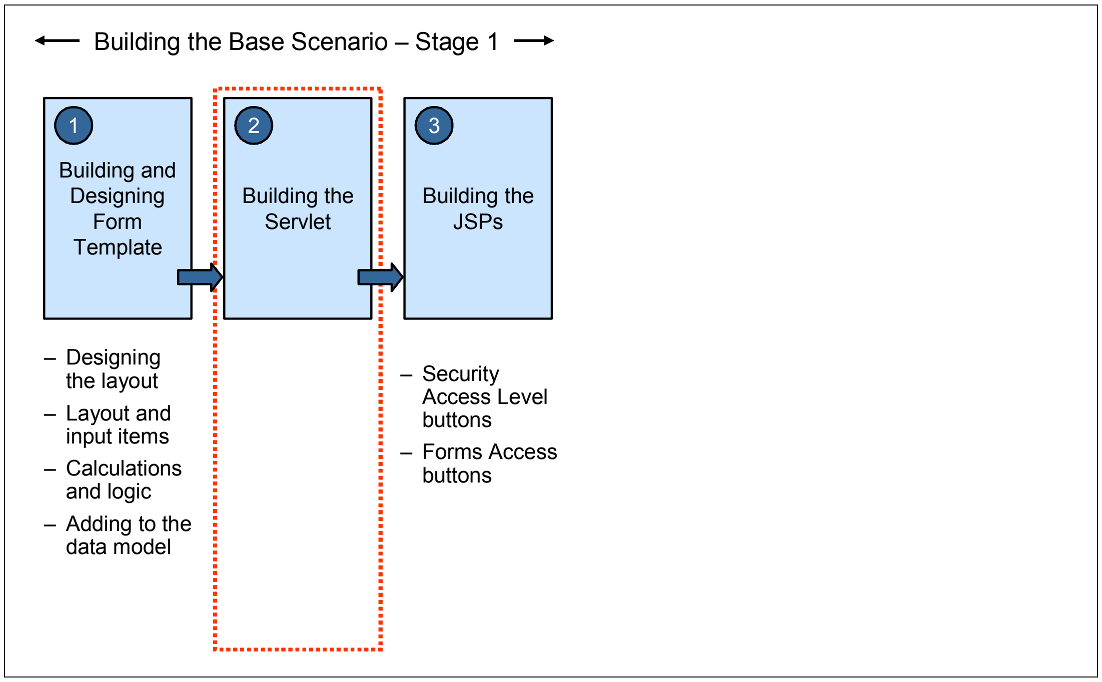


Figure 5-124 Overview of major steps involved in building the base scenario application

Stage 1 presents a *standalone* form scenario, where the form design does not require any interaction with external data (such as pre-filling it with some instantiation data or interaction with any external data sources during work on the form at the client side). The only interaction of the built application with the form is in the extraction of a form state value after submission. This value decides the directory to store the form in. That way the servlet represents the main business logic of the application.

5.11.2 Basic servlet methods

In the basic application, we use a servlet as a Web application. The servlet can be called by a URL submitted by a browser (or any other Web client) and exposes four basic methods to interact with the environment:

- The init method does basic servlet initiation and initiates the Workplace Forms API for future use.
- The doGet method is called whenever the client submits a GET request. This is a URL pointing to the servlet. It may contain additional parameters that can be evaluated in the servlet doGet method. This is a convenient way to request different actions from the servlet.

- The doPost method is called by any POST request submitted to the servlet. The POST request works like a GET request but receives an additional data stream. In this data stream, Forms Viewer ships the submitted XFDL data.
- The destroy method cleans up by destroying all necessary objects to free the allocated memory.

In our project, we use the actions in Table 5-32 for GET and POST.

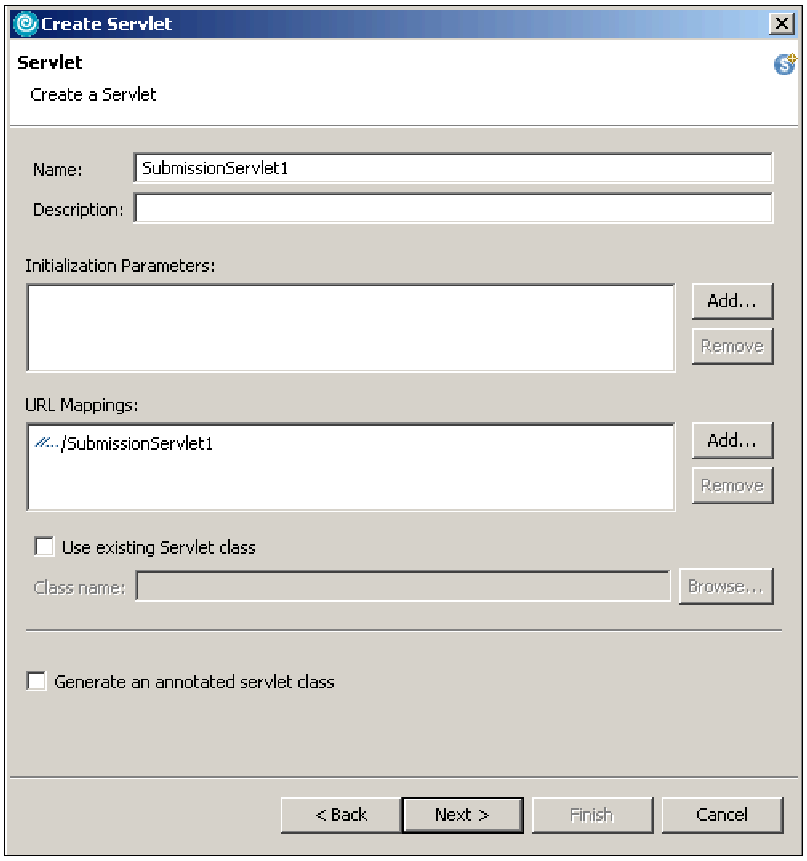
Table 5-32 List of supported actions in a GET/POST requests

Request	Parameters	Action performed
GET	action=listTemplates	Calls dirlisting1.jsp with the template folder as target.
GET	action=workbasket	Calls dirlisting1.jsp with one of the work folders as target (workbasket, manager approval, director approval) depending on current user role.
GET	action=listApproved	Calls dirlisting1.jsp with the folder with approved forms as target.
GET	action=listCancelled	Calls dirlisting1.jsp with the folder with cancelled forms as target.
GET	action=setRole&userRole=*XXXX*	Assigns a new user role (simulation of a new login with another user name/password). Called from index1.jsp using the available role buttons (1000 = Employee.... 1031 = Director).
GET	action=getJSP&jsp=*XXXX*	Requests the servlet to open a new JSP for the browser. This is a convenient method to route navigation from one JSP to another via the servlet as proxy. The servlet can control the parameters passed to every JSP called. The feature is used in navigation buttons on index1.jsp and Home buttons on all other JSPs.
POST	action=bounceback	Submits to the browser the received post data as XML content. This method is useful for tests. It requires a special button in the form with a submit URL containing the assigned parameter (http://*servletURL*?action=bounceback).
POST	action=store	Retrieves the order state and stores the received POST data to file system in a folder depending on the detected form state (submissions, manager approval, director approval, approved or completed orders). After this, the success1.jsp is called.

5.11.3 Servlet code skeleton

To create the new servlet that we use in our scenario:

1. Create a new Dynamic Web Project in Rational® Application Developer Version 6 (RAD6) and a new package. You can name it *WPForms261Stage1* or give it any other name of your choice.
2. Right-click the new package and select from the property box **New** → **Other** → **Web** → **Servlet**, as shown in Figure 5-125.



Create Servlet

Servlet

Create a Servlet

Name: SubmissionServlet1

Description:

Initialization Parameters:

URL Mappings:

/SubmissionServlet1

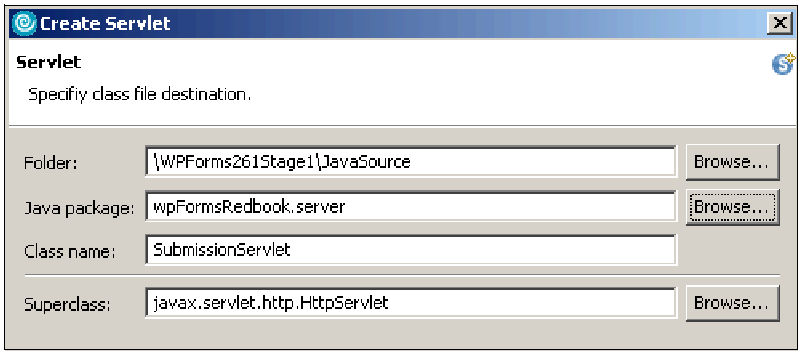
☐ Use existing Servlet class

Class name:

☐ Generate an annotated servlet class

Figure 5-125 New servlet basics

3. Give the servlet a name (in our scenario we use *Submissionservet1*), disable the **Generate an annotated servlet class** option, and click **Next**, as shown in Figure 5-126.



Create Servlet

Servlet

Specifiy class file destination.

Folder: \WPForms261Stage1\JavaSource

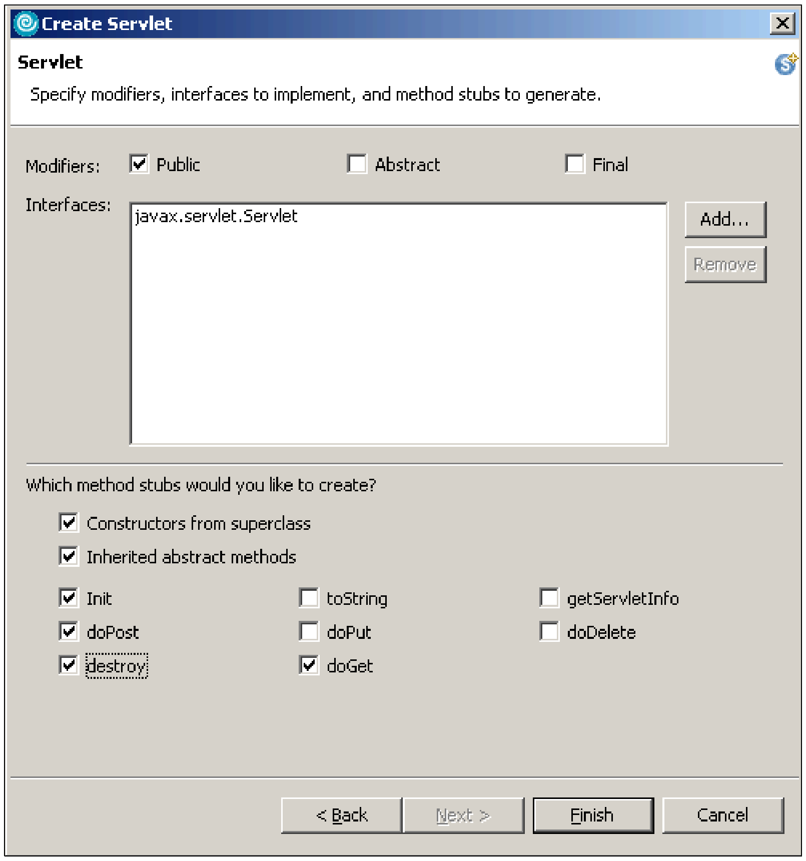
Java package: wpFormsRedbook.server

Class name: SubmissionServlet

Superclass: javax.servlet.http.HttpServlet

Figure 5-126 SubmissionServlet1 - package

4. Assign the newly created package and click **Next**. (See Figure 5-127.)


Create Servlet

Servlet

Specify modifiers, interfaces to implement, and method stubs to generate.

Modifiers: [✓] Public [ ] Abstract [ ] Final

Interfaces: javax.servlet.Servlet

Which method stubs would you like to create?

[✓] Constructors from superclass
[✓] Inherited abstract methods

[✓] Init	[ ] toString	[ ] getServletInfo
[✓] doPost	[ ] doPut	[ ] doDelete
[✓] destroy	[✓] doGet	

Figure 5-127 SubmissionServlet1 methods

5. Make sure that all four basic methods (Init, doGet, doPost, and destroy) are selected and click **Finish**.

The servlet comes with the skeleton code, as shown in Example 5-36. Note that the methods are reordered, all comments are deleted to make the example short, and the method SubmissionServlet1() is removed.

Example 5-36 New servlet code skeleton

```
package wpFormsRedbook.server;

import java.io.IOException;
import javax.servlet.Servlet;
import javax.servlet.ServletConfig;
import javax.servlet.ServletException;
import javax.servlet.http.HttpServlet;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;

public class SubmissionServlet1 extends HttpServlet implements Servlet {

   public void init(ServletConfig arg0) throws ServletException {
   }
   protected void doGet(HttpServletRequest arg0, HttpServletResponse arg1) throws 
ServletException, IOException {
    }
    protected void doPost(HttpServletRequest arg0, HttpServletResponse arg1) throws
ServletException, IOException {
    }
    public void destroy() {
    }
}
```

After the creation of the new servlet, an error message is shown in the Problems view.

We find that the generated description file is sometimes not accepted. In this case, double-click the **Deployment Descriptor** file in the project outline and open the **Source** tab.

Search the code for the entries shown in Example 5-37.

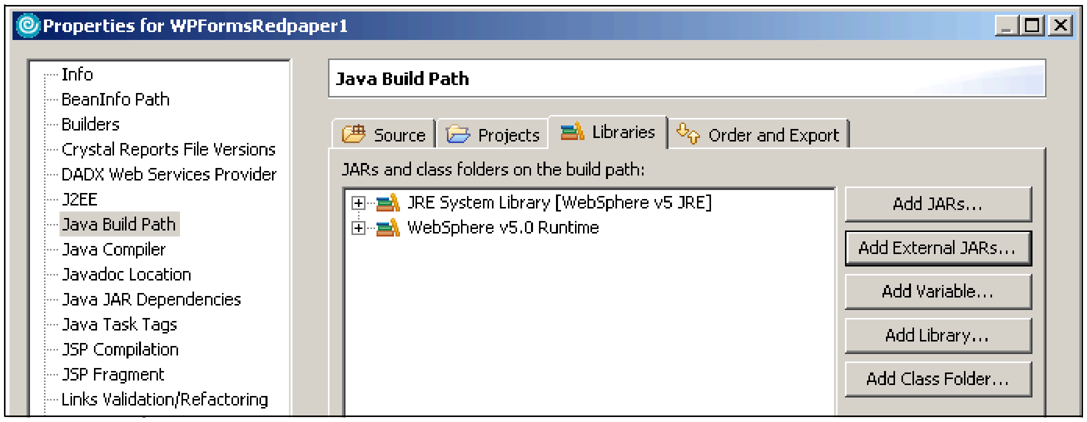
Example 5-37 Servlet code with description and display-name tags

```
<!-- @generated
wpFormsRedbook.server.SubmissionServlet1#web/servlet.wpFormsRedbook.server.SubmissionServle
t1 -->
        <servlet>
            <description>Form handler for stage 1</description>
            <display-name>SubmissionServlet1</display-name>
            <servlet-name>SubmissionServlet1</servlet-name>
            <servlet-class>wpFormsRedbook.server.SubmissionServlet1</servlet-class>
        </servlet>
```

After deleting the <description> and <display-name> tags and saving, the errors should be resolved.

To prepare the servlet for *productive use,* we add some external libraries and code for initiation:

1. Add the necessary external jars for the Workplace Forms API. Right-click the project, choose **Properties** from the context menu, select **Java Build Path**, and go to the **Libraries** tab, as shown in Figure 5-128.



JARs and class folders on the build path:

JRE System Library [WebSphere v5 JRE]
WebSphere v5.0 Runtime

Figure 5-128 Configure Java build path

2. Click **Add External JARs** and select in the folder of the installed API [System32]\PureEdge\70\java\classes pe_api.jar and uwi_api.jar (see Figure 5-129).

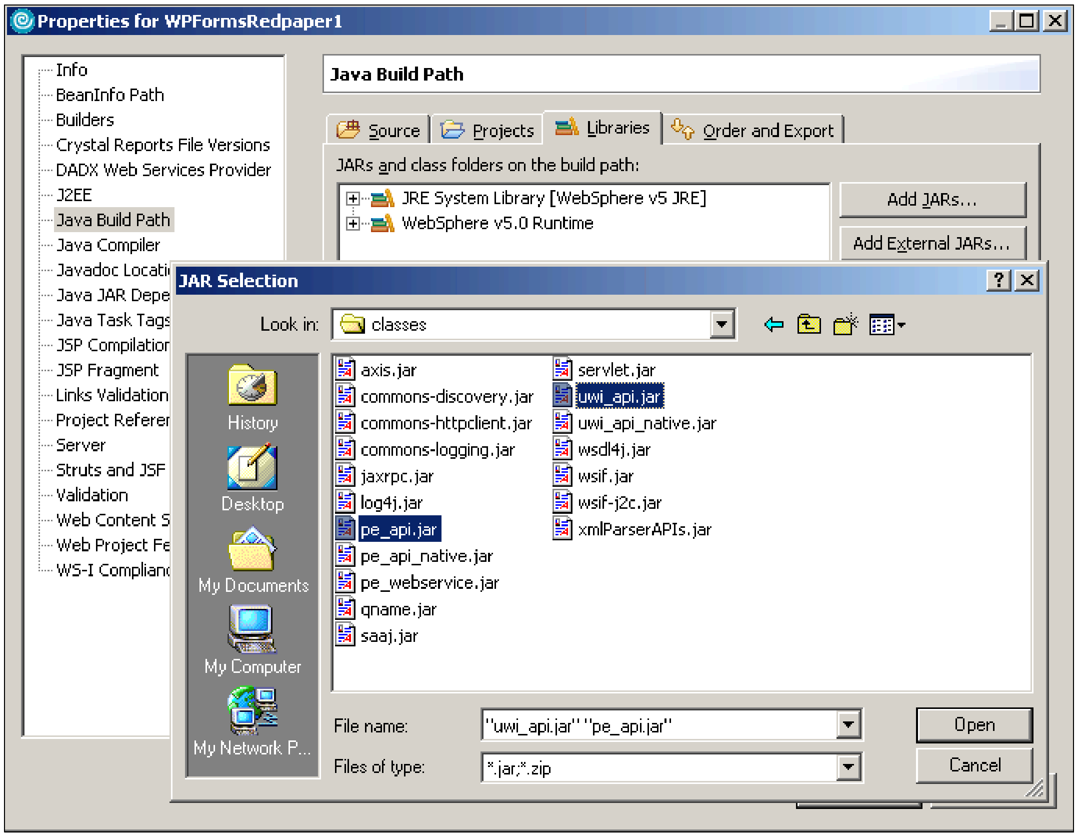


Figure 5-129 Adding external jars

3. Close the property box and open the newly created servlet code file (SubmissionServlet1.java).

4. Add all of the necessary imports. (The concrete imports can vary depending on the additional functionality you plan to implement. Here we reference all classes eventually used in this stage independent of the actual progress of coding. We have, during this time, some warnings about unused imports. Do not worry about this.) Insert the imports shown in Example 5-38.

Example 5-38 Init method code sample

```
import java.io.IOException;
import javax.servlet.ServletException;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;

import java.io.ByteArrayOutputStream;
import java.io.IOException;
import java.io.InputStream;
import java.io.PrintWriter;
import java.util.Date;
import java.util.Properties;

import javax.servlet.RequestDispatcher;
import javax.servlet.ServletConfig;
import javax.servlet.ServletContext;
import javax.servlet.ServletException;
import javax.servlet.http.HttpServlet;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;

import org.omg.CORBA.Any;

import com.PureEdge.DTK;
import com.PureEdge.IFSSingleton;
import com.PureEdge.error.UWIException;
import com.PureEdge.xfdl.FormNodeP;
import com.PureEdge.xfdl.XFDL;
```

5. Now we can start to add class attributes and initiation code. To store folder names mapping to state values and file name prefix for stored forms, we use a folders.properties file, as shown in Example 5-39.

Example 5-39 folders.properties file

```
TEMPLATE_FOLDER = \\Redpaper_Demo\\Form_Templates\\
1=\\Redpaper_Demo\\Form_Templates\\

MANAGER_FOLDER=\\Redpaper_Demo\\Manager_Forms\\
2=\\Redpaper_Demo\\Manager_Forms\\

DIRECTOR_FOLDER = \\Redpaper_Demo\\Director_Forms\\
3=\\Redpaper_Demo\\Director_Forms\\

APPROVED_FOLDER = \\Redpaper_Demo\\Approved_Forms\\
4=\\Redpaper_Demo\\Approved_Forms\\

SALES_REP_FOLDER = \\Redpaper_Demo\\Sales_Rep_Forms\\
5=\\Redpaper_Demo\\Sales_Rep_Forms\\

CANCELLED_FOLDER = \\Redpaper_Demo\\Cancelled_Forms\\
6=\\Redpaper_Demo\\Cancelled_Forms\\
FORM_NAME_PREFIX=RedPaperForm
```

6. Create this file in the WEB-INF folder of the project and start adding class parameters and code to the init method. Insert the initial body code to the created methods, as shown in Example 5-40.

Example 5-40 SubmissionServlet1 class with attributes init and destroy method

```
import java.io.IOException;
import java.util.Properties;

import javax.servlet.Servlet;
import javax.servlet.ServletConfig;
import javax.servlet.ServletException;
import javax.servlet.http.HttpServlet;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;

import java.io.InputStream;
import java.io.PrintWriter;
import java.util.Date;

import javax.servlet.RequestDispatcher;
import javax.servlet.ServletContext;

import com.PureEdge.DTK;
import com.PureEdge.IFSSingleton;
import com.PureEdge.error.UWIException;
import com.PureEdge.xfdl.FormNodeP;
import com.PureEdge.xfdl.XFDL;

import wpFormsRedbook.utils.Utils;


public class Test extends HttpServlet implements Servlet{

      //Form Storage Parameters
      private Properties props = null;
      private static String TEMPLATE_FOLDER;
      private static String MANAGER_FOLDER;
      private static String DIRECTOR_FOLDER;
      private static String APPROVED_FOLDER;
      private static String SALES_REP_FOLDER;
      private static String CANCELLED_FOLDER;
      private static String FORM_NAME_PREFIX;

      //Database Properties
      private Properties orderProps = null;

      //Form Meta-Data Related Parameters
      private final static String METADATA_INSTANCE_ID = "FormMetaData";

      private static ServletConfig conf;

      public void init(ServletConfig config) throws ServletException {
         conf = config;
         System.out.println("SubmissionServlet: init(): started");
         //Initialize the Workplace Forms API
         try {
            DTK.initialize("Forms 2.6.1 Redbook Demo", "1.0.0", "7.0.0");
         } catch (UWIException initE) {
            System.out
            .println("SubmissionServlet: init(): exception occurred 
initializing Workplace Forms API: "
                  + initE.toString());
         } catch (Exception anE) {
            System.out
            .println("SubmissionServlet: init(): exception occurred: "
                  + anE.toString());
         }
         //Read in the properties file for the submission folder names
         //Read in the properties file for the submission folder names
         try {
            ServletContext ctx = config.getServletContext();
            //ctx.getRealPath()
            InputStream inputStream = ctx
            .getResourceAsStream("/WEB-INF/folders.properties");
            props = new java.util.Properties();
            props.load(inputStream);
            TEMPLATE_FOLDER = props.getProperty("TEMPLATE_FOLDER");
            MANAGER_FOLDER = props.getProperty("MANAGER_FOLDER");
            DIRECTOR_FOLDER = props.getProperty("DIRECTOR_FOLDER");
            APPROVED_FOLDER = props.getProperty("APPROVED_FOLDER");
            SALES_REP_FOLDER = props.getProperty("SALES_REP_FOLDER");
            CANCELLED_FOLDER = props.getProperty("CANCELLED_FOLDER");
            FORM_NAME_PREFIX = props.getProperty("FORM_NAME_PREFIX");

         } catch (Exception anE) {
            System.out
            .println("SubmissionServlet: init(): exception occurred reading
properties file: "
                  + anE.toString());
         }
         System.out.println("SubmissionServlet: init(): completed");
      }

      public void destroy() {
         super.destroy();
      }

      protected void doGet(HttpServletRequest arg0, HttpServletResponse arg1)
throws ServletException, IOException {
         // TODO Auto-generated method stub
      }
      protected void doPost(HttpServletRequest arg0, HttpServletResponse arg1)
throws ServletException, IOException {
         // TODO Auto-generated method stub
      }

   }
```

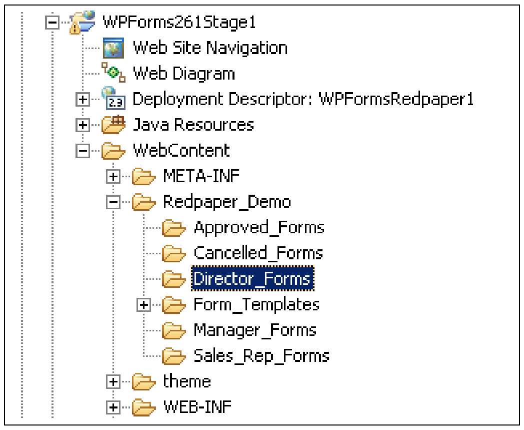
There is no forms-specific code except the DTK.initialize statement. It connects us to Workplace Forms API Version 7.0.0. This allows us to access the XFDL form in the code. The application name Forms 2.6.1 Redbook Demo allows us to assign our solution a special version of the Forms API in the PureEdgeAPI.ini file, if this is required. We do not use this feature here, since we do not run applications based on different API versions on our server.

We are now prepared to implement the doGet methods (operating in this stage only for navigation) and, later on, the doPost methods that handle the submitted form.

5.11.4 Creating a template repository and form storage structure

In stage 1 of the base scenario, we have no other storage medium but the file system (see Figure 5-130). To make it available to the application, we create in the WebContent folder of the project a sub-folder named Redpaper_Demo with subfolders, as named in the supplied folders.properties file:

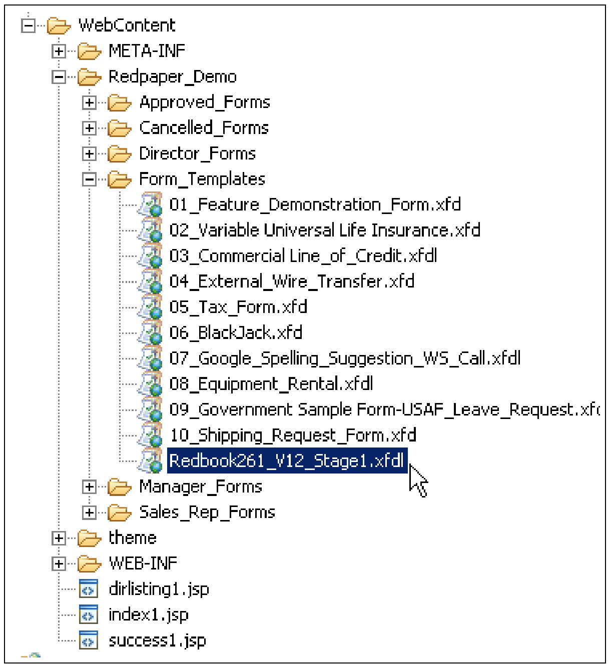
```
Redpaper_Demo/Form_Templates
Redpaper_Demo/Manager_Forms
Redpaper_Demo/Director_Forms
Redpaper_Demo/Approved_Forms
Redpaper_Demo/Sales_Rep_Forms
Redpaper_Demo/Cancelled_Forms
```



```
WPForms261Stage1
    Web Site Navigation
    Web Diagram
    Deployment Descriptor: WPFormsRedpaper1
    Java Resources
    WebContent
        META-INF
        Redpaper_Demo
            Approved_Forms
            Cancelled_Forms
            Director_Forms
            Form_Templates
            Manager_Forms
            Sales_Rep_Forms
        theme
        WEB-INF
```

Figure 5-130 Form storage directory Redpaper_Demo in WebContent folder

In the folder Redpaper_Demo/Form_Templates, paste the created forms (see Figure 5-131). To have a *real* list, we paste some arbitrary forms in the directory as well. The form we use at this stage is named Redbook261_V12_Stage1.xfdl.



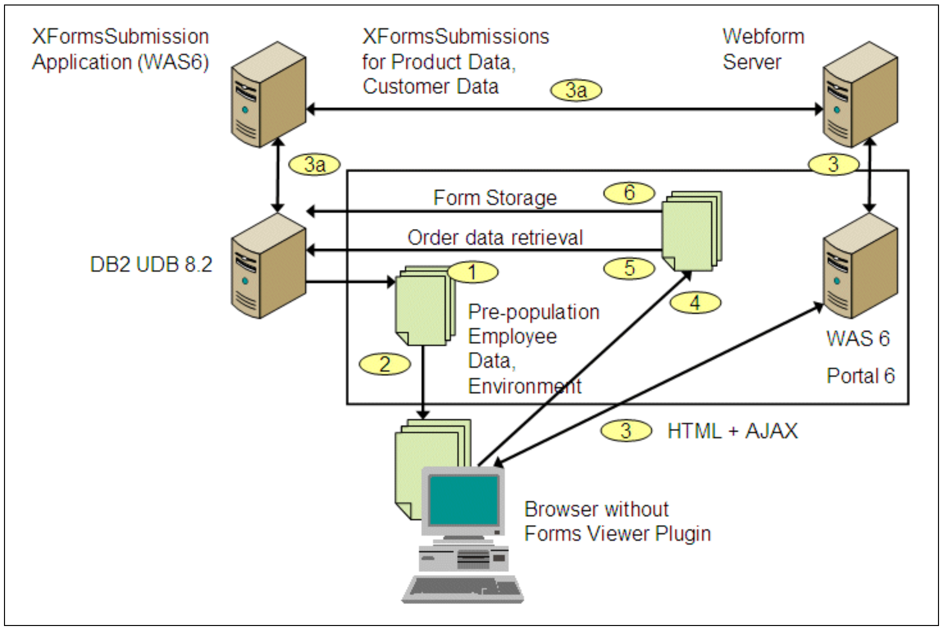
```
WebContent
    META-INF
    Redpaper_Demo
        Approved_Forms
        Cancelled_Forms
        Director_Forms
        Form_Templates
            01_Feature_Demonstration_Form.xfd
            02_Variable Universal Life Insurance.xfd
            03_Commercial Line_of_Credit.xfdl
            04_External_Wire_Transfer.xfd
            05_Tax_Form.xfd
            06_BlackJack.xfd
            07_Google_Spelling_Suggestion_WS_Call.xfdl
            08_Equipment_Rental.xfdl
            09_Government Sample Form-USAF_Leave_Request.xf
            10_Shipping_Request_Form.xfd
            Redbook261_V12_Stage1.xfdl
        Manager_Forms
        Sales_Rep_Forms
    theme
    WEB-INF
    dirlisting1.jsp
    index1.jsp
    success1.jsp
```

Figure 5-131 Same forms folder inside the project structure

This folder makes up the file storage in the directory <WASRoot>/installedapplications/<applicationName> on the application server. The real paths used for storage differ in the production system and the test server running in RAD6 IDE. The code provided here is valid for both cases, but the code provided in the JSPs to display the file list and generate appropriate links contains some if/then statements to match both environments. For details on this topic, see 5.12, “Creating JSPs” on page 353.

5.11.5 Servlet interaction for forms processing

The entry point of the application is index1.jsp. Open the URL http://servername:portname/WPForms261Stage1/index1.jsp in the browser to open the JSP. By selecting the **New Order** button, dirlisting1.jsp is activated and the list of available templates shows up. This is the starting point in the stage 1 form processing scenario. (See Figure 5-132.)



XFormsSubmission Application (WAS6)
XFormsSubmissions for Product Data, Customer Data
3a
Webform Server
3a
3
Form Storage
6
Order data retrieval
DB2 UDB 8.2
1
5
4
Pre-population Employee Data, Environment
2
WAS 6
Portal 6
3
HTML + AJAX
Browser without Forms Viewer Plugin

Figure 5-132 Stage 1 form processing scenario

Figure 5-132 shows a diagram of a basic form life cycle:

1. dirlisting1.jsp shows a list of all available forms in a file system directory. The directory shown depends on the task to proceed, and in some cases on the employee status selected in the welcome page:
   - New Order: Template directory is shown.
   - Work Basket/Employee: Directory with draft submissions is shown.
   - Work Basket/Manager: Directory with submissions for manager approval is shown.
   - Work Basket/Director: Directory with submissions for director approval is shown.
   - Approved: Directory with finally approved forms is shown.
   - Canceled: Directory with cancelled forms is shown.
2. When one of the links in the file list is clicked, a URL is generated that retrieves the selected form from the file server. At this stage, the application server does not access the form at all on form load.
3. After working on the form, the client submits it using a URL stored in the form. It points to the SubmissionServlet1 and activates the doPost method there. The method receives the

form, extracts some basic values (mainly the form name and state), and creates a form name if the form does not contain a valid name.

4. The SubmissionServlet1/doPost method creates a file name based on the formName and stores the form to the file system. The folder to store the form into is calculated based on the form state.

At this stage, the servlet does not really interact with the template or form on opening time. The called JSP exposes a URL enabling the browser to get the template or form from the file system via the HTTP server. The real interaction takes place when a form is submitted. Before we can code it, let us have a brief look at how to use the Workplace Forms API.

5.11.6 Accessing a form through the Workplace Forms API

The IBM Workplace Forms Server Application Programmer Interface (API) consists of a collection of programming tools to help you develop applications that can interact with XFDL forms. These tools are available for both C and Java programming environments. An API for COM interface is available as well. The API enables you to access and manipulate forms as structured data types.

The API is divided into two libraries: the Form Library and the Function Call Interface (FCI) Library. The Form Library allows you to create applications that:

- Read and write forms.
- Retrieve information from form elements.
- Add cells to certain form items.
- Insert information into form elements.

This is the part of the API (namely, the Form Library) that we focus on in this chapter.

The Function Call Interface (FCI) Library provides additional methods that:

- Create, duplicate, or delete form elements.
- Manipulate and verify digital signatures.
- Handle attachments.
- Create custom functions for use within XFDL forms.

For detailed information about the FCI, refer to the Workplace Forms Servers API documentation (C and Java versions):

http://www-128.ibm.com/developerworks/workplace/documentation/forms/

The Forms API is used to open a form from stream or file system as a complex tree structure and present a huge number of methods to navigate in the form, read and write data, or read and alter the form structure adding, changing or deleting nodes.

In this chapter we focus on basic methods to read and write data. For full information about the Forms API, see the product documentation available at the following URL:

http://www-128.ibm.com/developerworks/workplace/documentation/forms/

Refer to the following files:

- *WPForms API Setup Guide* (22914850.pdf)
- *WPForms API Java User Manual* (22914870.pdf)
- *WPForms API C User Manual* (22914860.pdf)
- *WPForms API COM User Manual* (22914880.pdf)

Accessing form data, in most cases, is done in three steps:

1. Open the form as formNodeP object. This step gives us the root node of the form as a starting point to other actions performed on the node structure.
2. Navigate to the data or structure object we are interested in (the field, the XFDL data instance, a button, an included WSDL file, an attribute, or any other node available in the form).
3. Access to the object (read/write/delete).

For each of these tasks, there are multiple methods available. We highly recommend that you consider the notes attached to function descriptions in the manual, since similar navigation and data access methods have different side effects (such as creating new nodes, if the requested node does not exist, or just to raise an error in the same case). Be aware that any changed node structure or data in signed areas of a form will break the signature.

A basic API program (shown here as a servlet) accessing a form available as a file may look like Example 5-41. (However, do *not* enter this code into your sample project. This code is for discussion purposes only.)

Example 5-41 Simple sample servlet using XFDL API

```
import java.io.*;
//servlet support
import javax.servlet.*;
import javax.servlet.http.*;

//WPForms API references
import com.PureEdge.DTK;
import com.PureEdge.xfdl.FormNodeP;
import com.PureEdge.xfdl.XFDL;
import com.PureEdge.IFSSingleton;

public class ProcessXFDL extends HttpServlet {

   private static FormNodeP theForm;

   //in do post we can read the submitted xfdl file as stream
   public void doPost(HttpServletRequest request, HttpServletResponse response)
         throws IOException {

      ServletOutputStream out = response.getOutputStream();
      ServletInputStream theStream = request.getInputStream();

      try {
         DTK.initialize("SimpleFormsTestServlet", "1.0.0", "7.0.0");

         XFDL theXFDL;
         //initialize the API
         theXFDL = IFSSingleton.getXFDL();

         if (theXFDL == null)
            throw new Exception("Could not find interface");

         //get access to the form from stream
         theForm = theXFDL.readForm(theStream, XFDL.UFL_SERVER_SPEED_FLAGS);

         //if the form is available as a file, the following code would fit:
         //theForm = theXFDL.readForm( "mypath/myfile.xfdl", 0);
         //now we can work with the form, e.g. retrieve a value of FIELD1 on
         // PAGE1
         String temp = theForm.getLiteralByRefEx(null, "PAGE1.FIELD1.value",
               0, null, null);

         //or get a data instance like this
         theForm.extractInstance("formData", null, null, "mypath/exp.xml",
               0, null, null, null);

         //or get an XForems instance like this
         StringWriter sw = new StringWriter();
         theForm.extractXFormsInstance(null, "instance('myInstance')/innerElement",
            false, true, null, sw);
         String retXML = sw.toString();

         //or set some additional fields
         theForm.setLiteralByRefEx(null, "PAGE1.FIELD2.value", 0, null,
               null, "new value");

         //we can save the form to file system or stream
         theForm.writeForm("mypath/mySavedForm.xfdl", null, 0);

         //finally we should free up memory
         theForm.destroy();

      } catch (Exception ex) {
         ex.printStackTrace();
      }
   } // end of method Post
} // end of class
```

Attention: There is a limitation of initializing the Forms API only *once* on a server. As a best practice, create a library containing the initialization statement and avoid subsequent initializations in the applications using the API.

After opening the XFDL file or stream, we access the form in three different ways in this example:

- ▸ Accessing nodes directly
- ▸ Writing data to XML data instances
- ▸ Writing data to XForms data instances

In this example we use the method getLiteralByRefEx/setLiteralByRefEx by assigning a text value to a node. This function cannot be used to assign complete XML trees, since the assigned text is automatically rendered in XML-compliant encoding (for example, changing < to &lt;).

Attention: Using XForms items in the form, we can only access their *values* through the XForms instance referenced by the item. This is a major change to data stored in XML instances, where the value can be accessed in both ways — via the related XML instance (if there was one) or by accessing the item on the XFDL page directly.

Accessing nodes directly can read/alter/delete any node. Using the API method getLiteralByRefEx/setLiteralByRefEx shown in this example, we create new nodes in case the referenced node does not exist. To react in any other way on missing nodes, we can use the code snippets shown in Example 5-42.

Example 5-42 Sample coding for missing nodes

```
if ((tempNode = theForm.dereferenceEx(null, "PAGE1.COLORFIELD", 0,
     FormNodeP.UFL_ITEM_REFERENCE, null)) == null)
{
   throw new UWIException("Could not locate COLORLABEL node.");
}
tempNode.setLiteralByRefEx(null, "PAGE1.COLORFIELD.VALUE", 0,
     null, null, "Purple");
```

Both access methods work fine accessing *real* field values (as shown in the examples) or other field properties addressable *by name*. In this book, we mainly use access to the data using read and write operations to XForms instances.

5.11.7 Extraction of form data

For form data extraction, three methods are available:

- Extracting single values using API
- Extracting data instances or parts of data instances using API
- Using text parsers to access any stored information

There are different insertion points for the extracting code, depending on the way the form is submitted. The Forms Viewer has three basic methods to return a form:

- Store on a file system.
- Submit as a mail attachment.
- Submit as an HTTP POST action.

Storing requests to the file system is discussed in 9.7, “Scenario 2 - integrating Forms Viewer with Notes Client - overview and objective” on page 573, and in 9.12, “Domino Forms Integration - solution considerations” on page 626. Submitting by e-mail is out of the scope of this book. The techniques shown here can be applied to all scenarios, depending on the programming languages available in the target system.

In our case (using a Web application handling the forms), make sure to submit the completed form in a POST action. Back to the application scenario, we are now ready to code parts of the doPost method responsible for receiving the submitted form and extracting some data. We can get the submitted form, retrieve data, and store it in the database. The following code is a short example of how to access the form data.

First, we implement some helper methods in the class:

- returnText — composes a simple HTML file as an error/message page sent to the browser
- returnJSP — opens a named JSP in the browser (the method used for success action and for application navigation later on)
- getFormAsString — returns the form as string; useful for debugging
- getFormBytes — returns a form as a byte array ready to store in a file
- getFormValue — gets data in the XFDL form addressed by an item reference
- setFormValue — writes data in the XFDL form addressed by an item reference
- allSignaturesAreValid — validates the signatures on a form

All these functions are stored in a static utility class in package wpFormsRedbook.utils. The coding is shown in Example 5-43.

Example 5-43 Helper methods for form handling in doPost

```
package wpFormsRedbook.utils;

import java.io.BufferedOutputStream;
import java.io.ByteArrayOutputStream;
import java.io.File;
import java.io.FileOutputStream;
import java.io.IOException;
import java.io.PrintWriter;
import java.io.StringReader;
import java.io.StringWriter;
import java.util.Date;

import javax.servlet.RequestDispatcher;
import javax.servlet.ServletException;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;

import com.PureEdge.error.UWIException;
import com.PureEdge.xfdl.FormNodeP;
import com.PureEdge.xfdl.XFDL;

/**
 * @author cmarston,arichter
 *
 * To change the template for this generated type comment go to
 * Window - Preferences - Java - Code Generation - Code and Comments
 */
public class Utils {

   /**
    *
    */
   public Utils() {
      super();

   }

   /**
    * writes data stored in a byte[] array to a file on file system
    *
    * @param outputFileNameAndPath
    * @param bytes
    * @throws IOException
    */
   public static void writeBytesToFile(String outputFileNameAndPath, byte[] bytes) throws
IOException{
      File outputFile = new File(outputFileNameAndPath);
      FileOutputStream fos = new FileOutputStream(outputFile);
      BufferedOutputStream bos = new BufferedOutputStream(fos);
      bos.write(bytes);
      bos.flush();
      bos.close();
   }

// read the form as byte[]
   /**
    * returns an XFDL form as a byte array
    *
    * @param theForm
    * @return
    * @throws UWIException
    * @throws IOException
    */
   public static byte[] getFormBytes(FormNodeP theForm) throws UWIException,
   IOException {
      ByteArrayOutputStream baos = new ByteArrayOutputStream();
      theForm.writeForm(baos, null, 0);
      baos.flush();
      return baos.toByteArray();
   }


   //return any error messages to web client (helper for the time being until we
   //have an error jsp)
   public static void returnText(HttpServletResponse response, String outputString,
         String mimeType) throws IOException {
      //Set Headers so that the response is not cached
      response.setStatus(HttpServletResponse.SC_OK);
      response.setHeader("Pragma", "No-cache");
      response.setHeader("Cache-Control", "no-cache");
      response.setDateHeader("Expires", new Date().getTime());
      response.setHeader("Expires-Absolute", "Thu, 01 Dec 1994 16:00:00 GMT");
      response.setContentType(mimeType);

      System.out
      .println("SubmissionServlet: writing formString to response OuputStream");
      PrintWriter pw = new PrintWriter(response.getOutputStream());
      pw.write(outputString);
      pw.flush();
      pw.close();
   }

   //read form as String
   public static String getFormAsString(FormNodeP theForm)
   throws UWIException, IOException {
      ByteArrayOutputStream baos = new ByteArrayOutputStream();
      theForm.writeForm(baos, null, 0);
      baos.flush();
      return baos.toString();
   }

   //proxy method calling any jsp identified by jsp file name jspName
   public static void returnJSP(HttpServletRequest request,
         HttpServletResponse response, String jspName)
      throws ServletException, IOException {
      //Return response page
      response.setStatus(HttpServletResponse.SC_OK);
      response.setHeader("Pragma", "No-cache");
      response.setHeader("Cache-Control", "no-cache");
      response.setDateHeader("Expires", new Date().getTime());
      response.setHeader("Expires-Absolute", "Thu, 01 Dec 1994 16:00:00 GMT");
      RequestDispatcher view = request.getRequestDispatcher(jspName);
      view.forward(request, response);
      System.out.println("SubmissionServlet1: returning response JSP");
   }
```

```
/**
 * write 1 log entry
 *
 * @param log
 */
private static void p(String log) {
   System.out.println(log);
}



/**
 * gets data in the xfdl form addressed by an item reference
 * dependent on the syntax in pathToItem parameter, the code will access an
 * XFDL item or data in an XForms instance
 *
 * @param theForm the xfdl form
 * @param pathToItempath (or XPath expression) to the item to read
 * @param returnMode"stripe" will stripe the outer element of the returned instance
 *                all other values will return the value or instance "as is"
 * @return the value of the item
 */
public static String getFormValue(FormNodeP theForm, String pathToItem, String
      returnMode) {
   String ret = "";
   try {
      if (pathToItem.indexOf("instance('") == 0){
         p ("try extraxt XForms instance: " + pathToItem );
         //extract from XForms instance

         StringWriter sw = new StringWriter();
         //extract data instance from xfdl as StringWriter
         theForm.extractXFormsInstance(null, pathToItem ,false, true, null, sw);
         p(" xforms instance extracted");
         //read extracted instance to String ret
         ret = sw.toString();
         if ((!ret.equals("")) && returnMode.equals("stripe")){
            ret = ret.substring(ret.indexOf(">")+1, ret.lastIndexOf("<"));
         }
      } else {
         //extract an item value
         p(" read form item: " + pathToItem);
         ret = theForm.getLiteralByRefEx(null, pathToItem, 0, null, null);
         if (ret == null) {
            p("value not found");
            ret = "";
         }
      }


   } catch (UWIException e) {
      e.printStackTrace();
   }
   p("getFormValue: " + pathToItem + " mode" + returnMode + "value: '" + ret + "'");
   return ret;
}


/**
```

```
 * sets writes data in the xfdl form addressed by an item reference
 * dependent on the syntax in pathToItem parameter, the code will access an
 * XFDL item or data in an XForms instance
 *
 * @param theForm
 * @param pathToItem (XPath expression to an XForms instance or XFDL path)
 * @param value
 */
public static void setFormValue(FormNodeP theForm, String pathToItem,
      String value) {
   try {

      if (pathToItem.indexOf("instance('") == 0){
         p ("try update XForms instance: " + pathToItem );
         String element = pathToItem.substring(pathToItem.lastIndexOf("/")+1,
            pathToItem.length());
         String updateXML = value;
         if (!element.equals("")){ //we are going to replace an inner element -> add
                                 //the element tags!!!

            if (element.indexOf("[")>0) {
               element = element.substring(0,element.indexOf("["));
            }
         updateXML = "<" + element + ">" + value + "</" + element + ">";
         }
         p("updateXML:" + updateXML);
         StringReader r = new StringReader(updateXML);
         //update data instance from xfdl as stream
         theForm.updateXFormsInstance(null, pathToItem ,null, r,
            XFDL.UFL_XFORMS_UPDATE_REPLACE);
         p(" xforms instance updated");
         //String tmp = getFormValue(theForm, pathToItem,"");
      } else {
         theForm.setLiteralByRefEx(null, pathToItem, 0, null, null, value);
         p("setFormValue: " + pathToItem + " -> [" + value + "] - done");
      }

   } catch (UWIException e) {
      e.printStackTrace();
   }
   return;
}


/**
 * check for valid signatures
 *
 * @param theForm
 * @return true or false
 * @throws Exception
 */
public static boolean allSignaturesAreValid(FormNodeP theForm)
throws Exception {
   return (theForm.verifyAllSignatures(false) == FormNodeP.UFL_SIGS_OK);
}
```

Create the code for the doPost method (Example 5-44). The basic flow is as follows:

1. Detect the operation evaluating the action parameter.
2. Access the form with the API.
3. Process the action:
   - Bounceback for debug, or
   - Normal operation: Extract values.
4. Send a response to the browser.

Example 5-44 Form handling in doPost - value extraction

```
public void doPost(HttpServletRequest request, HttpServletResponse response)
throws ServletException, IOException {
   System.out.println("SubmissionServlet: doPost started");

   //Initialize member variables
   String action = null; //Controls the processing action, response from
   // Servlet
   XFDL theXFDL = null; //The form
   FormNodeP theForm = null; //Represents nodes of the XFDL form
   String formString = null; //String representation of the form. Used for
   // the 'bounceback' feature.

   //Form State variables
   String formState = null; //The current state of the form
   String previousFormState = null; //The previous state of the form
   String formName = null; //Used in Stage 1 as the file name when
   // persisting the form to the file system

   /**
    * Processing.
    * Determine the type of request. Currently supported options include:
    *
    * 1) [listTemplates, null] Display 'listTemplates' JSP. This is the
    *    default behavior if no action is specified.
    * 2) [listForms] Display 'listForms' JSP.
    * 3) [store] Store form, display 'submissionComplete' JSP. If needed,
    *    the previous version is removed.
    * 4) [bounceback] For test purposes, returns the form as an text/xml
    *    response page.
    */
   try {
      action = request.getParameter("action");
      if (action== null) action="";
      if (action.equalsIgnoreCase("bounceback")) {
         formString = Utils.getFormAsString(theForm);
      } else if (action.equalsIgnoreCase("store")) {
         System.out
         .println("SubmissionServlet: detected -->store<-- request.");
         action = "store";

         /**
          * Read in the form
          */
         System.out
         .println("SubmissionServlet: doPost: reading Form from request InputStream");
         theXFDL = IFSSingleton.getXFDL();
         //theForm = theXFDL.readForm(request.getInputStream(),
            XFDL.UFL_SERVER_SPEED_FLAGS);
         theForm = theXFDL.readForm(request.getInputStream(),0); // Server speed flags
               //will cause errors on extractXFormsInstance method ...
         //***********************************************
         // OK _ HERE WE HAVE ACCESS TO THE FORM
         // FIRST - WE SHOULD VALIDATE SIGNATURES
         //***********************************************


         /**
          * Implement the business logic - Extract the form State evaluate it
          */

         formState = Utils.getFormValue(theForm,"instance('" + METADATA_INSTANCE_ID
                  + "')/State","stripe");
         System.out.println("SubmissionServlet: doPost: FormState by getFormValue: "
                  + formState);
         if (formState.equals("1")) formState="5"; //these are drafts form sales reps
         if (formState.equals(""))formState="5";
            //unknown states will map to 5 - sales rep forms (drafts)

         previousFormState = Utils.getFormValue(theForm,"instance('" +
            METADATA_INSTANCE_ID + "')/PreviousState","stripe");
         System.out.println("SubmissionServlet: doPost: PreviousFormState by
               getFormValue: "+ previousFormState);
         if (previousFormState.equals("1")) previousFormState="5";
            //these are drafts form sales reps
         if (previousFormState.equals(""))previousFormState="5";
            //unknown states will map to 5 - sales rep forms (drafts)


         //If this is the first submission of a form, set a new filename
         // into the form
         formName = Utils.getFormValue(theForm,"instance('" + METADATA_INSTANCE_ID +
            "')/FileName","stripe");
         if (formName == null)formName = "";
         if (formName.equals("")) {
            formName = "" + System.currentTimeMillis();
            Utils.setFormValue(theForm,"instance('" + METADATA_INSTANCE_ID +
               "')/FileName",formName);
         }

         System.out.println("PATH: " + request.getServletPath());
         formName = FORM_NAME_PREFIX + formName + ".xfdl";

         System.out.println("SubmissionServlet: doPost: formName by getFormValue: "+
            formName);

         //printFormToStandardOut(theForm);

         //******************************************************
         // OK _ HERE WE COULD STORE THE FORM - E.G. TO FILE SYSTEM
         //******************************************************

      } else {
         System.out
         .println("SubmissionServlet: doPost: specified action parameter value -->"
               + action
               + "<-- is not supported.  Currently the following are supported"
               + "[update,store, or blank which defaults to store.]");
```

```
            action = "unsupportedaction";
         }

         if (theForm != null) {
            System.out
            .println("SubmissionServlet: doPost: calling destroy() on theForm");
            theForm.destroy();
         }
      } catch (Exception processingE) {
         System.out
         .println("SubmissionServlet: doPost: Exception processing request: "
               + processingE.toString());
         Utils.returnText(response,
               "SubmissionServlet: doPost: Exception occured: "
               + processingE.toString(), "text/plain");
         return;
      }
      /**
       * Return the appropriate response based on the action variable. <BR>
       */
      try {
         //Switch based on the specified action
         if (action.equalsIgnoreCase("store")) {
            Utils.returnJSP(request, response, "/success1.jsp");
         } else if (action.equalsIgnoreCase("update")) {
            System.out
            .println("SubmissionServlet: update is not currently implemented");
         } else {
            throw new Exception(
            "SubmissionServlet: unexpected state, taking no action");
         }
      } catch (Exception anE) {
         try {
            if (theForm != null) {
               theForm.destroy();
            }
         } catch (Exception anotherE) {
            System.out.println("SubmissionServlet: Nested Exception: "
                  + anotherE.toString());
         }
         response.setContentType("text/html");
         PrintWriter out = new PrintWriter(response.getOutputStream());
         out.write(anE.toString());
         out.flush();
         out.close();
         System.out.println("SubmissionServlet: Exception: "
               + anE.toString());
      }
      System.out.println("SubmissionServlet: doPost: completed.");
   }
```

In the sample code above we can see that there are several tries on the appropriate parameters reading the form:

```
//theForm =
theXFDL.readForm(request.getInputStream(),XFDL.UFL_SERVER_SPEED_FLAGS);
theForm = theXFDL.readForm(request.getInputStream(),0); // Server speed flags
will cause errors on extractXFormsInstance method ...
```

Continuing work on the form by providing more features as prepopulation on form load using XForms submissions and applying signatures, we return to these statements over and over searching for parameters that are able to open any form without knowing the special features utilized in the form or the form state.

In the end, we find — with the help of the product support — the following configuration that worked for us in all use cases. See Example 5-45.

Example 5-45 Final code to open a form in Forms API used in all scenarios (J2EE + Domino)

```
private static final int READFORM_XFORMS_INIT_ONLY = (XFDL.UFL_SERVER_SPEED_FLAGS
& (~XFDL.UFL_XFORMS_OFF) | XFDL.UFL_XFORMS_INITIALIZE_ONLY);

FormNodeP theForm = theXFDL.readForm(str,READFORM_XFORMS_INIT_ONLY);

StringWriter myWriter = new StringWriter();
Boolean writeRelevant = false;
Boolean ignoreFailures = true;
theForm.extractXFormsInstance(null, myPathToItem ,writeRelevant, ignoreFailures,
null, myWriter);
String ret = sw.toString()
```

Here are some explanations to the parameters in readForm and extractXFormsInstance methods. We have these specific conditions in the form (and we believe that these conditions are not really academic only):

- Signed and unsigned forms
- XForms submissions fired on form load for prepopulation

The parameters for the readForm method are based on the following considerations:

1. As a starting point, we took the parameter set XFDL.UFL_SERVER_SPEED_FLAGS, believing that this should be quite near common requirements made up on opening a form with the API.
2. If signatures were in the form, we ran into errors using this parameter. We found similar errors opening forms with XForms instances having a renamed <data> root element. To overcome this, we turned the XForms engine on reading those forms: XFDL.UFL_SERVER_SPEED_FLAGS & (~XFDL.UFL_XFORMS_OFF).
3. The XFDL form created for stage 2 contained XForms submissions to be activated on form load in the Viewer or Webform server (ev:event="xforms-model-construct-done"). Those submissions run into an error if they are activated while loading the form with the API only. So, opening the form with the API, we had to limit the XForms engine to run only for the first node structure build. (Event xforms-model-construct-done is fired just after the first node structure build.) Stopping the XForms engine after node structure construction can be done by adding the flag XFDL.UFL_XFORMS_INITIALIZE_ONLY. Hence, the final configuration to read a form was:

   ```
   (XFDL.UFL_SERVER_SPEED_FLAGS & (~XFDL.UFL_XFORMS_OFF) |
   XFDL.UFL_XFORMS_INITIALIZE_ONLY)
   ```

Note: Be aware of changes to the defined value for XFDL.UFL_SERVER_SPEED_FLAGS in Forms Versions 2.6 and 2.6.1. To utilize maximum performance, in Version 2.6.1 the XForms engine is turned off in addition to the settings in Version 2.6. So applying the same code to Versions 2.6 and 2.6.1, we can expect deviating results in performance or even in functionality in some cases. The custom flags defined here should work in both Versions 2.6 and 2.6.1.

Writing back data to the form with the method updateXFormsInstance, in some cases we should take care to populate the applied changes in the form (including data stored in XML instances and XFDL attributes). This can be done using the method xmlModelUpdate(). This method would activate, for example, an XFDL formula to read a submission URL from an XForms instance and assign the value to an XFDL submit button with the get/set functions.

In addition to that, there is a restriction as to what parameters are allowable accessing values in the XForms instances (method extractXFormsInstance, parameters writeRelevant and ignoreFailures) based on the state of how the form was loaded or not (XForms engine on or off).

When server speed flags are on in the extractXFormsInstance method, we cannot ask the XForms engine to write only the relevant elements, nor can you ask it to not ignore failures, because the engine has been turned off. Setting these flags incorrectly results in the error message `invalid parameters`, without detailed information of what was wrong.

The code accessing the form values (functions getFormValue and setFormValue) is located in the created Utils class. (Add an import for this class to resolve the errors.) It can read and write both XFDL data objects (for example, addressed with a path like PAGE3.FIELD2.value or global.global.custom:value) and data stored in XForms instances (addressed with an XPath expression like instance('ExportData')/CustomerData. In this book, we generally access data stored in the XForms instances.

Having the values of interest extracted (for the first stage, these are state, previousState, and formName), we can go on to do more sophisticated actions and store the form.

5.11.8 Signature validation

Another interesting action when receiving a form is signature checking. Insert the following code in place of the signature comment (see Example 5-46).

Example 5-46 Sample coding for signature checking

```
/**
 * Validate form signatures. If any signatures are invalid, then
 * return. TODO: Add a JSP response that indicates tampering.
 */
if (! Utils.allSignaturesAreValid(theForm)) {
   System.out
         .println("SubmissionServlet: doPost: WARNING --
         signatures were invalid");
   Utils. returnText(response,
         "Error, one or more signatures were invalid!!
         Form submission processing halted.","text/plain");
   theForm.destroy();
   return;
} else {
   System.out.println("SubmissionServlet: doPost: validation OK");
```

```
            }
```

The code is supported by an additional helper method that we already created in the Utils class. It is pretty simple to detect any changes to signed items.

There are other methods available to check the validity of a single signature (verifySignature) or even to read signature validity status on the last signature check to track newly occurred violations (getSignatureVerificationStatus).

Attention: There is no method to detect which item was changed in the form with a broken signature, since a signature is basically a hash code including all items to sign in one step. The validation fails if any item is changed.

5.11.9 Form storage to local file system

Having all tasks completed, we can store the file to file system. The code provided for now already creates a file name (formName variable). The code to add performs the following actions:

- Evaluate the form state to determine the target directory to store the form.
- Store the form.
- Remove earlier versions of this form in any other directory. (We only want to keep the actual form.)

Tip: It is not always necessary to store the form. In some cases it may be the right way to extract only some values and throw the XFDL away.

We have already created the file system structure for storage, so we can use it now. Insert the code (shown in Example 5-47) at the right place in the doPost method (see the comment for file storage there).

Example 5-47 Status indication, target folder calculation, file storage and clean-up

```
            /**
             * Store the form into the folder indicated by the formState.
             */
            String folderPath = props.getProperty(formState);

            ServletContext ctx = conf.getServletContext();
            String path = ctx.getRealPath(folderPath);

            Utils.writeBytesToFile(path + formName, Utils.getFormBytes(theForm));

            /**
             * Remove the previous instance of the form. *STAGE 1*
             *
             */
            if (previousFormState == null) {
               System.out.println("SubmissionServlet: doPost: FormMetaData: ERROR:
PreviousFormState element was null");
            } else if (previousFormState.equals(formState)){
               System.out.println("No state change");
            } else if (previousFormState.equalsIgnoreCase("2")
                  || previousFormState.equalsIgnoreCase("3")
                  || previousFormState.equalsIgnoreCase("5")) {
```

```
                System.out.println("SubmissionServlet: doPost: FormMetaData:
previousFormState [          "+                    previousFormState
                      + "] indicates previous file deletion is necessary");
                folderPath = props.getProperty(previousFormState);
                String previousFormPath = ctx.getRealPath(folderPath);
                File file = new File(previousFormPath + File.separator + formName);
                System.out.println("Deleting: " + previousFormPath + File.separator +
formName);
                if (!(file == null)) file.delete();

             } else {
                System.out.println("SubmissionServlet: doPost: FormMetaData:
PreviousFormState element contained value: "
                + previousFormState + ", which does not indicate deletion.");
             }
```

As you can see, the provided code contains the main part of the business logic (storing files according to state). The rest of the application logic is contained in the JSPs offering all application navigation dealing with the doGet method that calls the servlet URL with different action parameters attached.

5.11.10 Servlet doGet method for application navigation

The doGet method in stage 1 primarily provides assisting functions. All are not related to the Workplace Forms functionality. This changes in stage 2, when form prepopulation comes into play.

For now, we are only doing navigation support and user identity management. To have an easy way for user identification, we decide not to implement server security at this stage. Instead, we provide an application-based security model that passes the employee ID to any call's (JSP or servlet) doGet method. It is used to set this ID for the session to any of the available employee IDs.

Actually, there are no new helper methods to implement, since we do all necessary steps for doPost in the previous section. The servlet accepts the following action parameters:

- listTemplates — calls dirlisting1.jsp listing the templates directory.
- workbasket — calls dilisting1.jsp listing one of the folders for sales rep. forms, manager approval, or director approval (forms in state 1, 2, or 3) depending on the user role.
- listApproved — calls dilisting1.jsp listing approved forms (forms in state 4).
- listCancelled — calls dilisting1.jsp listing approved forms (forms in state 6).
- getJSP — navigates just to a dedicated JSP.

Each time the servlet activates a JSP, it provides the user context (user ID) and possible other application state data to it.

The doGet code is shown in Example 5-48.

Example 5-48 Servlet doGet method

```
protected void doGet(HttpServletRequest request, HttpServletResponse response)
          throws ServletException, IOException {
      try {

          /**
           * Obtain the user identity
           */
          //TODO: Replace this with real user id lookup
          String userID = null;
          if (request.getSession().getAttribute("userRole") != null) {
             userID = (String) request.getSession().getAttribute("userRole");
             System.out
             .println("SubmissionServlet: doGet: request parameter 'userRole' was loaded 
from Session as: "
                  + userID);
          } else {
             System.out
             .println("SubmissionServlet: doGet: request parameter 'userRole' was not 
specified, using default value of 1000");
             userID = "1000";
          }
          request.setAttribute("userRole", userID);

          /**
           * Obtain the type of request from the key=value params and set the
           * necessary folder into the session
           */
          String action = request.getParameter("action");
          if (action == null || action.equalsIgnoreCase("listTemplates")) {
             System.out
             .println("SubmissionServlet: doGet: detected -->listTemplates<-- request.");
             request.setAttribute("FOLDER", TEMPLATE_FOLDER);
          } else if (action.equalsIgnoreCase("workbasket")) {
             System.out
             .println("SubmissionServlet: doGet: detected -->workbasket<-- request.");
             if (userID.equalsIgnoreCase("1010")
                  || userID.equalsIgnoreCase("1020")
                  || userID.equalsIgnoreCase("1030")) {
               request.setAttribute("FOLDER", MANAGER_FOLDER);
               System.out
               .println("SubmissionServlet: doGet: workbasket: setting folder to: "
                     + MANAGER_FOLDER);
             } else if (userID.equalsIgnoreCase("1031")) {
               request.setAttribute("FOLDER", DIRECTOR_FOLDER);
               System.out
               .println("SubmissionServlet: doGet: workbasket: setting folder to: "
                     + DIRECTOR_FOLDER);
             } else {
               request.setAttribute("FOLDER", SALES_REP_FOLDER);
               System.out
               .println("SubmissionServlet: doGet: workbasket: setting folder to: "
                     + SALES_REP_FOLDER);
             }
          } else if (action.equalsIgnoreCase("listApproved")) {
             System.out
             .println("SubmissionServlet: doGet: detected -->listApproved<-- request.");
             request.setAttribute("FOLDER", APPROVED_FOLDER);
          } else if (action.equalsIgnoreCase("getJSP")) {
             System.out
             .println("SubmissionServlet: doGet: detected -->getJSP<-- request.");
             String jsp = request.getParameter("jsp");
             if (jsp == null) {
               Utils.returnText(
                     response,
                     "SubmissionServlet: for getJSP, parameter jsp must not be null.",
               "text/plain");
             } else {
               System.out
               .println("SubmissionServlet: doGet: getJSP: jsp = "
                     + jsp);
               Utils.returnJSP(request, response, jsp);
               return;
             }
          } else if (action.equalsIgnoreCase("listCancelled")) {
             System.out
             .println("SubmissionServlet: doGet: detected -->listCancelled<-- request.");
             request.setAttribute("FOLDER", CANCELLED_FOLDER);

          } else if (action.equalsIgnoreCase("setRole")) {
             System.out
             .println("SubmissionServlet: doGet: detected -->setRole<-- request.");
             String userRole = request.getParameter("userRole");
             if (userRole == null) {
               System.out
               .println("SubmissionServlet: setRole: parameter userRole was null.
Defaulting to Employee role, 1000");
               request.getSession().setAttribute("userRole", "1000");
             } else {
               System.out
               .println("SubmissionServlet: setRole: parameter userRole was: "
                     + userRole
                     + ". Storing into session for later use.");
               request.getSession().setAttribute("userRole", userRole);
             }
             request.setAttribute("userRole", userRole);
             Utils.returnJSP(request, response, "/index1.jsp");
             return;
          } else {
             System.out
             .println("SubmissionServlet: doGet: unexpected action param detected: "
                   + action);
          }

          /**
           * Store the foldername into the session for use in the JSP -
           * initial, default state is 1
           */
          Utils.returnJSP(request, response, "/dirlisting1.jsp");
       } catch (Exception doGetE) {
          System.out
          .println("SubmissionServlet: doGet: Exception processing request: "
               + doGetE.toString());
          Utils.returnText(response,
               "SubmissionServlet: doGet: Exception occured: "
               + doGetE.toString(), "text/plain");
       }
    }
```

This method is strongly related to the JSPs in the application.

5.12 Creating JSPs

In the following discussion we show you how to create the JSPs.

5.12.1 Where we are in the process: building stage 1 of the base scenario

Figure 5-133 provides an overview of the key steps involved in building the base scenario, which focuses on building the form, the servlet, and the JSPs.

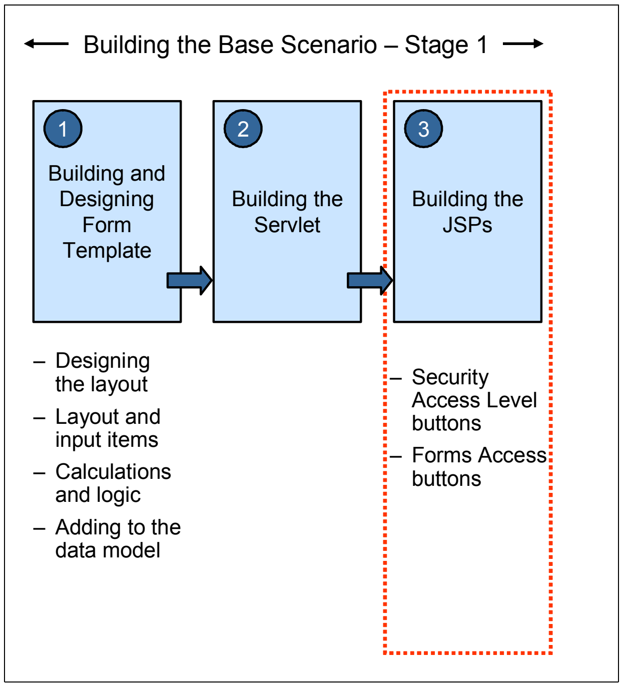


Figure 5-133 Overview of major steps involved in building the core base scenario application

Java Server Pages (JSPs) allow you to develop dynamic, content-driven Web pages that separate the user interface (UI) from constantly changing data that may be generated from an external source. JSP tags can be combined with HTML to allow you to format the appearance of the content on the Web page.

For the example used in this stage of the book, you need to create three JSPs, namely, index1.jsp, dirlisting1.jsp, and success1.jsp. You can use any Web application development tool such as Rational Application Developer (RAD), Eclipse, or DreamWeaver in order to create these JSPs. All of the JSPs contained here are created using RAD, and subsequently all of the figures have a RAD context.

index1.jsp

The index1.jsp is the main entry point and navigation page for the Web application that your sales team will use as a launching point to access all of the forms that they need to initiate or complete a sale, as well as to see all of the data associated with their customers.

Employees, managers, and directors are able to see unique views of all of the forms that are stored on the file system — new orders, any items in their own workbasket that require review and approval, all approved forms, and all forms that have been rejected or cancelled.

Figure 5-134 shows what the final page is going to look like. You can change the HTML layout, stylesheet, and graphics to suit your own taste. The important functionality, however, is contained in the buttons that you see on the page.

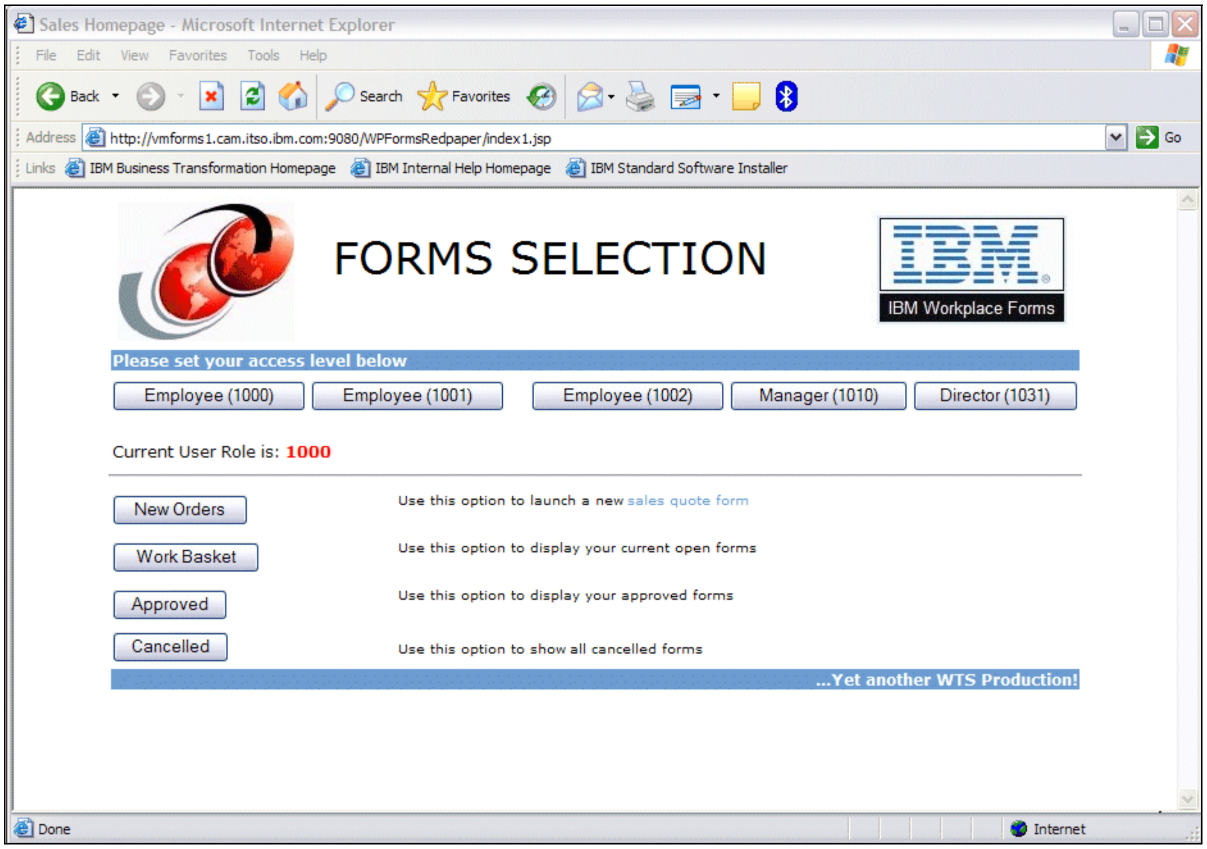
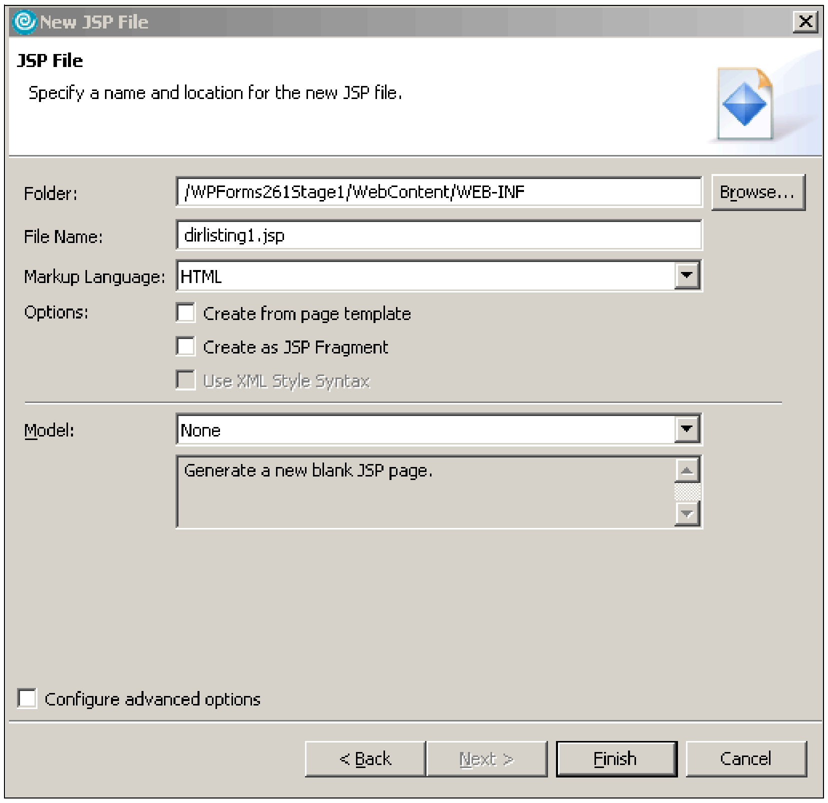

Sales Homepage - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://vmforms1.cam.itso.ibm.com:9080/WPFormsRedpaper/index1.jsp Go
Links IBM Business Transformation Homepage IBM Internal Help Homepage IBM Standard Software Installer
FORMS SELECTION
IBM Workplace Forms
Please set your access level below
Employee (1000)
Employee (1001)
Employee (1002)
Manager (1010)
Director (1031)
Current User Role is: 1000
New Orders
Use this option to launch a new sales quote form
Work Basket
Use this option to display your current open forms
Approved
Use this option to display your approved forms
Cancelled
Use this option to show all cancelled forms
...Yet another WTS Production!
Done
Internet

Figure 5-134 index1.jsp

> **Important:** In order to run this Web application on WebSphere Application Server correctly, you need to save all of the JSPs to the root WebContent directory and not in the WEB-INF directory. All graphics and cascaded style-sheets should be stored in a directory called *themes*, also in the root.

The steps are:

1. Using your Web application development tool, create a new JSP file, name it `index1.jsp`, and save it to the root WebContent directory (Figure 5-135).



Folder: /WPForms261Stage1/WebContent/WEB-INF
File Name: dirlisting1.jsp
Markup Language: HTML
Options: Create from page template; Create as JSP Fragment; Use XML Style Syntax
Model: None
Generate a new blank JSP page.
Configure advanced options

Figure 5-135 New JSP creation

2. In the <HEAD> section of the JSP file, give the path to the cascaded style-sheet that is used for the page in the <LINK href="theme/...> section and enter the <TITLE> as *Sales Homepage*, as shown in Example 5-49.

Example 5-49 Coding example (<TITLE> = Sales Homepage)

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
<HTML>
<HEAD>
<META http-equiv="Content-Type" content="text/html; charset=ISO-8859-1">
<META name="GENERATOR" content="IBM Software Development Platform">
<META http-equiv="Content-Style-Type" content="text/css">
<LINK href="theme/blue.css" rel="stylesheet" type="text/css">
<TITLE>Sales Homepage</TITLE>
</HEAD>
```

3. In the <BODY> section, create tables to display:
   - Logo graphics
   - Security access level buttons
   - Form access buttons

Logo graphics

In Example 5-50 we simply add a table with three columns, with a logo graphic on the left, a header in the middle, and a graphic on the right. Note that all of the graphics are contained in the folder called *theme*.

Example 5-50 Logo graphics

```
<BODY>
<!-- Table to display the logo graphics -->
<CENTER>
<TABLE border="0" cellpadding="2" width="760">
   <TBODY>
      <TR>
         <TD><IMG border="0" src="theme/redbook_logo.jpg" width="138"
            height="114" align="left"></TD>
         <TD align="left">
         <H1>FORMS SELECTION</H1>
         </TD>
         <TD><IMG border="0" src="theme/Workplace_Forms.jpg" width="158"
            height="92" align="right"></TD>
      </TR>
   </TBODY>
</TABLE>
</CENTER>
```

Security Access Level buttons

This table contains important security access level information in buttons (see Example 5-51) that are to be submitted to the servlet. These, in turn, control the information that is returned and displayed from the other JSPs, which are described later.

Each button has a userRole value, and when clicked, submits an action that sets the user credentials in the session and passes this to the servlet. The users from 1000–1002 have the role of *employee*, user 1010 has the role of *manager*, and user 1031 has the role of *director*.

We also use the user ID number to prepopulate the form with metadata about the employee from the DB2 database. This includes first name, last name, personnel number, e-mail address, and the manager's ID.

Attention: We decided to implement security in this way, rather than by using a separate login page, to make the demonstration flow more easily. In a real-world scenario, all authentication should pass through a login page that would pass the user credentials to the servlet.

Example 5-51 Security access level buttons

```
<CENTER>
<%@ page session="false" contentType="text/html"
   import="java.util.*,java.io.File"%>
<%
         String userID = (String) request.getAttribute("userRole");
         if (userID== null) userID="1000";
         if (userID.equals("")) userID="1000";
          %>
<!-- Table to Display Access Level Selection Buttons -->
<TABLE width="760">

   <TR>
```

```
      <TD colspan="3">

      <TABLE>
      <TR>
      <TD>
      <FORM method=get action="SubmissionServlet1">
      <INPUT type="submit" value="Employee (1000)">
      <INPUT type="hidden" name=action value="setRole">
      <INPUT type="hidden" name=userRole value="1000">
      </FORM>
      </TD>
            <TD width="304">
      <FORM method=get action="SubmissionServlet1">
      <INPUT type="submit" value="Employee (1001)">
      <INPUT type="hidden" name=action value="setRole">
      <INPUT type="hidden" name=userRole value="1001">
      </FORM>
      </TD>
      <TD>
      <FORM method=get action="SubmissionServlet1">
      <INPUT type="submit" value="Employee (1002)">
      <INPUT type="hidden" name=action value="setRole">
      <INPUT type="hidden" name=userRole value="1002">
      </FORM>
      </TD>
            <TD>
      <FORM method=get action="SubmissionServlet1">
      <INPUT type="submit" value="Manager (1010)">
      <INPUT type="hidden" name=action value="setRole">
      <INPUT type="hidden" name=userRole value="1010">
      </FORM>
      </TD>
            <TD>
      <FORM method=get action="SubmissionServlet1">
      <INPUT type="submit" value="Director (1031)">
      <INPUT type="hidden" name=action value="setRole">
      <INPUT type="hidden" name=userRole value="1031">
      </FORM>
      </TD>
      </TR>
      <TR>  <TD colspan="3"><%="Current User Role is: <STRONG>" + userID + "</STRONG>"
%></TD></TR>
   </TABLE>
```

Forms Access buttons

The behavior of Forms Access buttons is controlled by the userRole values that are set in the previous step above. If a user does not set his security access role, then the default role that is set is *employee*. Once the user ID has been set and passed to the *dirlisting.jsp* by the servlet, the data that is returned when the user clicks any button is dependent on his access level. For example, clicking the Workbasket button displays only the forms that are specific to the user ID.

There are four buttons that you need to create:

- New Orders: This button submits an action with a value of *listTemplates* to the SubmissionServlet1, which returns all of the new forms stored in a directory on the server file system named *Form_Templates*.

- Workbasket: This button submits an action with a value of *workbasket* and passes in the userID to the SubmissionServlet1. This returns only the forms that the user has created and submitted. These forms are stored in a directory on the server file system named *Sales_Rep_Forms*.
- Approved: This button submits an action with a value of *listApproved* to the servlet, which returns all of the forms in the Approved_Forms directory that have been approved by the manager or director role. All forms that have a value over $10,000.00 require manager approval, and all forms over $50,000.00 require director approval.
- Cancelled: This button submits an action with a value of *cancelled* to the servlet, which returns all of the new forms stored in a directory on the server file system named Cancelled_Forms. These are the forms that have not been approved by the manager or director.

We show you how to create these buttons in Example 5-52.

Example 5-52 Forms selection

```
<!-- Table to display the Forms Selection -->
<TABLE width="760" align="center">
   <TR>
      <TD>
      <FORM method="get"
         action="/WPForms261Stage1/SubmissionServlet1">
         <INPUT type="submit" value="New Orders">
         <INPUT type="hidden" name=action value="listTemplates">
      </TD>
      <TD><FONT size="-2">Use this option to launch a new <A
         href="/WPForms261Stage1/SubmissionServlet1">sales quote form</A></FONT>
      </FORM>
      </TD>
   </TR>
   <TR>
      <TD>
      <FORM method="get"
         action="/WPForms261Stage1/SubmissionServlet1"><INPUT
         type="submit" value="Work Basket">
         <INPUT type="hidden" name=action value="workbasket">
         <INPUT type="hidden" name=id value="<%=userID%>">
      </TD>
      <TD><FONT size="-2">Use this option to display your current open forms</FONT>
      </FORM>
      </TD>
   </TR>
   <TR>
      <TD>
      <FORM method="get" action="SubmissionServlet1"><INPUT
         type="submit" value="Approved">
               <INPUT type="hidden" name=action value="listApproved">
      </TD>
      <TD><FONT size="-2">Use this option to display your approved forms</FONT>
      </FORM>
      </TD>
   </TR>
   <TR>
      <TD>
      <FORM method=get action="SubmissionServlet1">
      <INPUT type="submit" value="Cancelled">
      <INPUT type="hidden" name=action value="listCancelled">
      </TD>
      <TD><FONT size="-2">Use this option to show all cancelled forms</FONT>
      </TD>
      </FORM>
      </TD>
   </TR>
   <TABLE>

      </TD>
   </TR>
</TABLE>
```

The JSP shown above (see Example 5-52 on page 358) creates several actions calling the SubmissionServlet1 with additional parameters. To create the appropriate links, we create, for each button, a separate HTML form element containing the necessary parameters. Each input element with type *hidden* creates a parameter in the URL. Example 5-53 creates a URL like this:

```
http://servername/WPFormsRedbook/SubmissionServlet1?action=action_param_val&param_
1_name=add_param_1_val&...&param_n_name=add_param_n_val
```

Example 5-53 Creating a GET action with additional parameters

```
<FORM method="get" action="/WPFormsRedbook/SubmissionServlet1">
      <INPUT type="submit" value="[Button Label]">
      <INPUT type="hidden" name=action value="[action_param_val]">
      <INPUT type="hidden" name=[param_1_name] value="[add_param_1_val]">
      .....
      <INPUT type="hidden" name=[param_n_name] value="[add_param_n_val]">
      <FONT size="-2">#button description#
      <A href="/WPFormsRedbook/SubmissionServlet1">sales quote form</A>
      </FONT>
   </FORM>
```

dirlisting1.jsp

The *dirlisting1.jsp* is used to display all of the forms that are currently stored on the file system of the server, and it is launched by the servlet. Depending on the button that is clicked on the *index1.jsp* and which security role is set, the dirlisting1.jsp dynamically updates the forms listed in the folder on the file system for that user. This JSP looks specifically for forms in six folders on the server's file system, located in the following directory:

```
C:\AppServer\installedApps\vmforms1\WPFormsRedpaper_war.ear\WPFormsRedpaper.war\
Redpaper_Demo\:
```

The the six folders are:

- Form_Templates
- Sales_Rep_Forms
- Approved_Forms
- Cancelled_Forms
- Manager_Forms
- Director_Forms

The steps to create this JSP are:

1. Create a new JSP named `dirlisting1.jsp` and save it to the root WebContent directory.
2. The contents of the JSP should be as shown in Example 5-54.

Example 5-54 dirlisting1.jsp provides links to the available files in an assigned folder in file system

```
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=ISO-8859-1">
<meta http-equiv="Content-Style-Type" content="text/css">
<link rel="stylesheet" href="theme/blue.css" type="text/css">
<title>IBM Workplace Forms Selection</title>
</head>

<CENTER>
<TABLE border="0" cellpadding="2" width="760">
   <TBODY>
      <TR>
         <TD><IMG border="0" src="theme/redbook_logo.jpg" width="138"
            height="114" align="left"></TD>
         <TD align="left">
         <H1>FORMS SELECTION</H1>
         </TD>
         <TD><IMG border="0" src="theme/Workplace_Forms.jpg" width="158"
            height="92" align="right"></TD>
      </TR>
   </TBODY>
</TABLE>
</CENTER>

<%@ page session="false" contentType="text/html"
   import="java.util.*,java.io.File"%>


<%String theDir = (String) request.getAttribute("FOLDER");
         String prepop = (String) request.getAttribute("PrePop");
         String userID = (String) request.getAttribute("userRole");
         //prepop will control link behavior
         if (prepop == null)
            prepop = "No";
            prepop = "Yes";
         //The path to the current template, including the template name
         String servletPath = application.getRealPath(request
               .getServletPath());

         //Remove subdirs including WEB-INF
         System.out.println("servletPath: " + servletPath);
         String projectName = "WPFormsRedpaper";
         String path = servletPath;
         String linkPath = "";
         if (path.indexOf(java.io.File.separator + "WebContent"
               + java.io.File.separator) > 0) {
            path = path.substring(0, path.lastIndexOf("WebContent") - 1);
            path = path + java.io.File.separator + "WebContent";
            linkPath = path.substring(path.indexOf(projectName) - 1, path
                  .lastIndexOf(java.io.File.separator) - 1);
            linkPath = "/" + projectName + theDir;
         } else {
            path = path.substring(0, path
                  .lastIndexOf(java.io.File.separator));
            linkPath = "/" + projectName + theDir;
         }
         String link=linkPath.replace('\\','/');
         if (prepop.equals("Yes")) {
         link = "/"+projectName +"/" + "SubmissionServlet1" + "?action=prepop&template=" +
path + theDir;
         }
         //Add relative template path
         String templatePath = path + theDir;
         System.out.println("templatePath: " + templatePath);
         //strip drive
         if (templatePath.indexOf(":") > 0)
            templatePath = templatePath
                  .substring(
                        templatePath.indexOf(java.io.File.separator),
                        templatePath.length());

         File dir = new File(templatePath);
         try {
            if (dir.isDirectory()) {
               String[] children = dir.list();
            }%>

<TABLE border="0" width="760" align="center">
   <TR>
      <TD bgcolor="#699ccf"><B>Please select a Form from the Dynamic E-Form
      Library below</B><BR>
      </TD>
   </TR>
   <TR>
      <TD>Current Directory is : <STRONG><%=dir.getName()%></STRONG>
&nbsp;&nbsp;&nbsp;&nbsp;Current User Role is: <STRONG><%=userID%></STRONG>
      <P><HR></P>
      <TABLE border="0">
         <%String[] child = dir.list();
            for (int i = 0; i < child.length; i++) {
               File Eform = new File(dir, child[i]);%>
         <TR>
            <TD><A href="<%= link + Eform.getName()%>"><%="Template:" +
Eform.getName()%></A></TD>
         </TR>
         <%}%>

         <%} catch (Exception ex) {
            ex.printStackTrace();
         }

      %>



      </TABLE>
      </TD>
   </TR>
   <TR>
      <TD align="center">
      <FORM method=get action="SubmissionServlet1">
      <INPUT type="submit" value="Home">
      <INPUT type="hidden" name=action value="getJSP">
      <INPUT type="hidden" name=jsp value="index1.jsp">
      </FORM>
   </TR>
</TABLE>

<TABLE width="760" align="center">
   <tr bgcolor="#699ccf">
      <td align="right"><B>...Yet another WTS Production!</B></td>
   </tr>
</TABLE>
```

Adaptive handling of absolute and relative paths to stored XFDL forms

A basic concept of this JSP is the adaptive handling of absolute and relative paths to the stored XFDL forms in both the runtime test environment in RAD6 and the production environment in the application server directory structure.

The JSP code first detects the path to the servlet rendered from the JSP (Variable servletPath). If this path contains the folder WebContent, we are in the test environment. Otherwise, we are in the deployed Web application. According to the environment detection, the code creates a variable containing the path to the project directory (variable path). Next, it computes the relative path to the template (linkPath) used in the action retrieving the template from the server and the absolute path to the file on file system (variable templatePath).

In case of prepopulation (prepop =”Yes”), the original link to the template file is replaced with a URL calling the SubmissionServlet1 with the appropriate parameters (action= ..., template= ....).

Created links

Table 5-33 illustrates the links generated within dirlisting1.jsp.

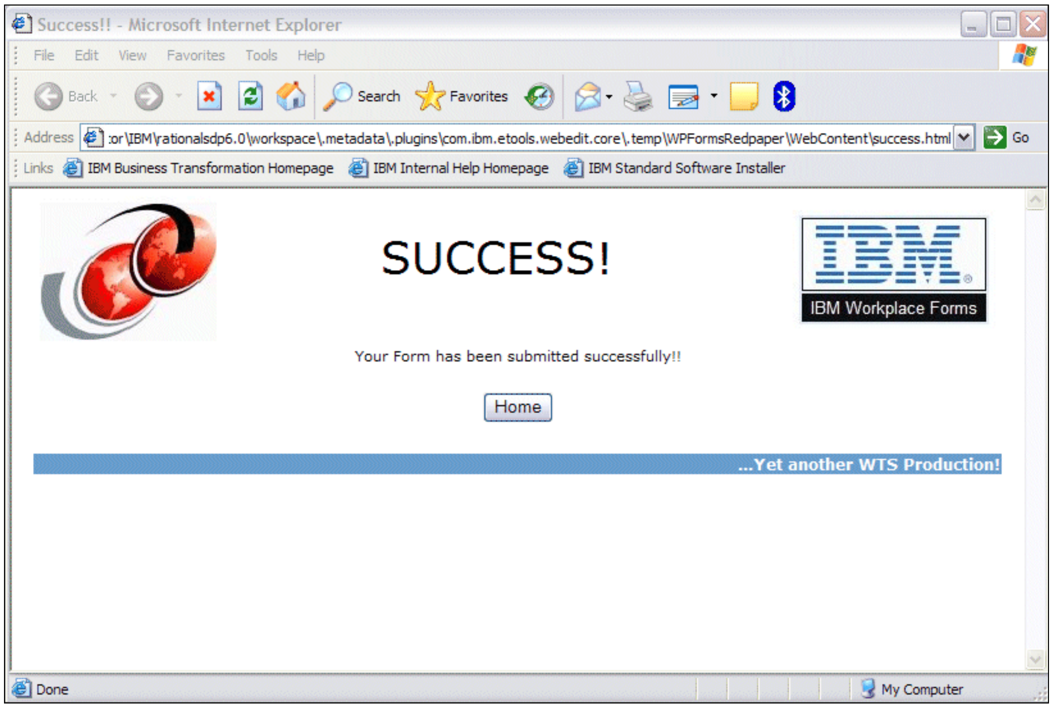
Table 5-33 Examples for the generated actions in dirlistling1.jsp (Stage 1)

	Generated URL
RAD6 test environment	
New form	http://localhost:9080/WPFormsRedpaper/WebContent/Redpaper_Demo/Form_Templates/Redpaper_Forms_Sample_S2_v41.xfdl
Open stored form	http://localhost:9080/WPFormsRedpaper/WebContent/Redpaper_Demo/Approved_Forms/Quote_Approval_Form1000143.xfdl
Deployed application	
New form	http://vmforms1.cam.itso.ibm.com:10000/WPFormsRedpaper/Redpaper_Demo/Form_Templates/Redpaper_Forms_Sample_S2_v41.xfdl
Open stored form	http://vmforms1.cam.itso.ibm.com:10000/WPFormsRedpaper/Redpaper_Demo/Approved_Forms/Quote_Approval_Form1000143.xfdl

success1.jsp

This JSP is used to inform a user that her form has been successfully submitted. The servlet is responsible for launching this form once the user has gone through the steps of filling it out and submitting it for approval.

Figure 5-136 is a sample of what the success1.jsp looks like.


Success!! - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address :or\IBM\rationalsdp6.0\workspace\.metadata\.plugins\com.ibm.etools.webedit.core\.temp\WPFormsRedpaper\WebContent\success.html Go
Links IBM Business Transformation Homepage IBM Internal Help Homepage IBM Standard Software Installer
IBM Workplace Forms
Home
Done
My Computer

SUCCESS!

Your Form has been submitted successfully!!

...Yet another WTS Production!

Figure 5-136 Rendering of success 1.jsp

Example 5-55 shows a sample of the code that can go into this JSP.

Example 5-55 success1.jsp

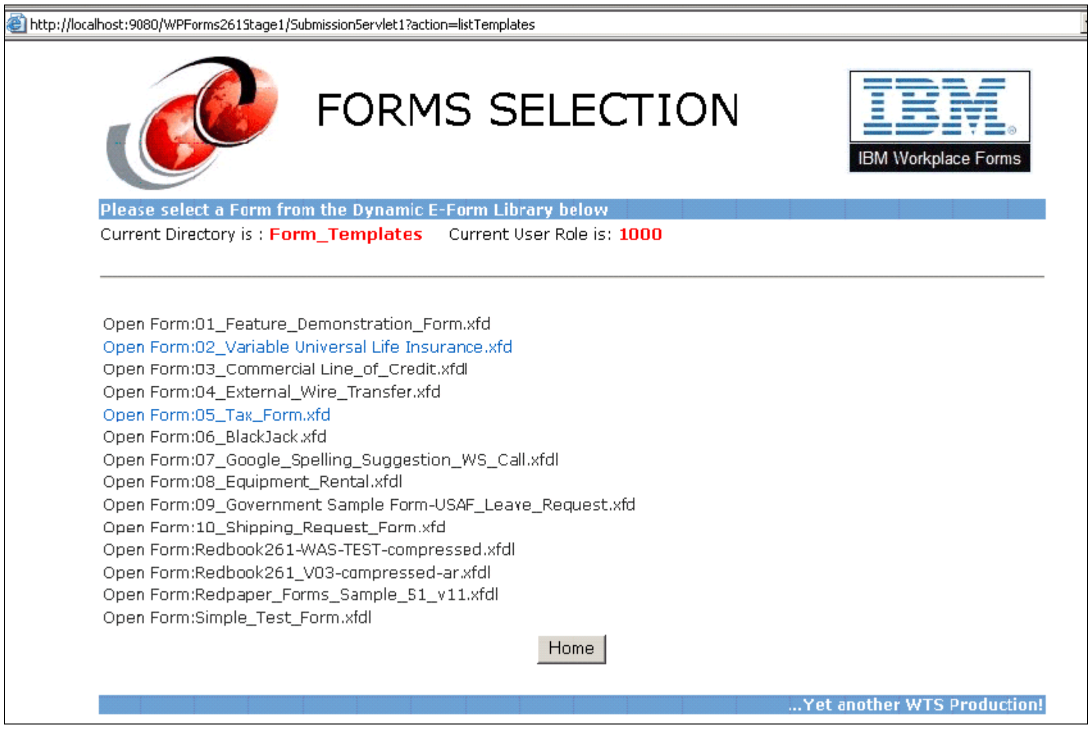
```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
<HTML>
<HEAD>
<META http-equiv="Content-Type" content="text/html; charset=ISO-8859-1">
<META name="GENERATOR" content="IBM Software Development Platform">
<META http-equiv="Content-Style-Type" content="text/css">
<LINK href="theme/blue.css" rel="stylesheet" type="text/css">
<TITLE>Success!!</TITLE>
</HEAD>
<BODY>
<CENTER>
<TABLE border="0" cellpadding="2" width="760" >
   <TBODY>
      <TR>
         <TD><IMG border="0" src="theme/redbook_logo.jpg" width="138"
            height="114" align="left"></TD>
         <TD align="left"><H1 align="center">SUCCESS!</H1></TD>
         <TD><IMG border="0" src="theme/Workplace_Forms.jpg" width="158"
            height="92" align="right"></TD>
      </TR>
   </TBODY>
</TABLE>
</CENTER>
```

```
<CENTER>
Your Form has been submitted successfully!!

</CENTER>
<P>
<TABLE align="center">
      <TR>

               <TD align="center">
      <FORM method=get action="SubmissionServlet1">
      <INPUT type="submit" value="Home">
      <INPUT type="hidden" name=action value="getJSP">
      <INPUT type="hidden" name=jsp value="index1.jsp">
      </FORM>

         </TR>
</TABLE>

<TABLE width="760" align="center">
   <tr bgcolor="#699ccf">
      <td align="right"><B>...Yet another WTS Production!</B></td>
   </tr>
</TABLE>
</HTML>
```

5.12.2 Form template listing

Once a user has selected his role and then selected the button to create a new sales quote order, the *dirlisting1.jsp* displays a list of the relevant form templates that they are authorized to use. The user can then click one of the links to launch a new form and begin the sales quote order process.

Figure 5-137 shows a sample of all of the forms listed in the Form_Templates folder from the file system that a user (employee) is able to see (1000).



http://localhost:9080/WPForms261Stage1/SubmissionServlet1?action=listTemplates

FORMS SELECTION

Please select a Form from the Dynamic E-Form Library below

Current Directory is : Form_Templates   Current User Role is: 1000

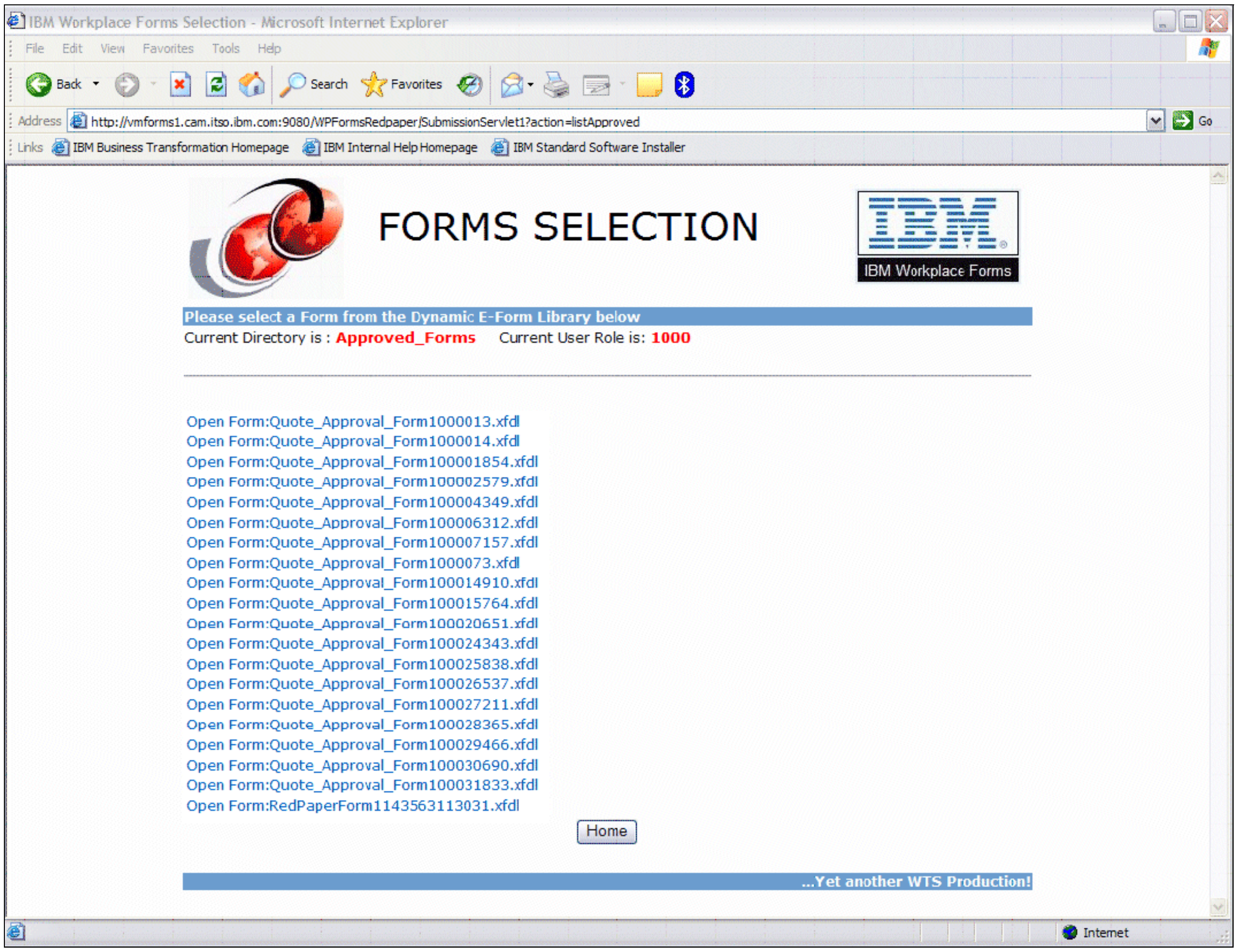
Open Form:01_Feature_Demonstration_Form.xfd
Open Form:02_Variable Universal Life Insurance.xfd
Open Form:03_Commercial Line_of_Credit.xfdl
Open Form:04_External_Wire_Transfer.xfd
Open Form:05_Tax_Form.xfd
Open Form:06_BlackJack.xfd
Open Form:07_Google_Spelling_Suggestion_WS_Call.xfdl
Open Form:08_Equipment_Rental.xfdl
Open Form:09_Government Sample Form-USAF_Leave_Request.xfd
Open Form:10_Shipping_Request_Form.xfd
Open Form:Redbook261-WAS-TEST-compressed.xfdl
Open Form:Redbook261_V03-compressed-ar.xfdl
Open Form:Redpaper_Forms_Sample_51_v11.xfdl
Open Form:Simple_Test_Form.xfdl

Figure 5-137 Form template listing using dirlisting1.jsp

5.12.3 Approved form listing

The Approved button allows the user to view all forms that have gone through the approval process. Clicking this button utilizes the *dirlisting1.jsp*, which displays the contents of the Approved_Forms folder.

Figure 5-138 shows a sample Approved_Forms listing view.


IBM Workplace Forms Selection - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://vmforms1.cam.itso.ibm.com:9080/WPFormsRedpaper/SubmissionServlet1?action=listApproved
Go
Links IBM Business Transformation Homepage IBM Internal Help Homepage IBM Standard Software Installer
FORMS SELECTION
IBM Workplace Forms
Internet

Please select a Form from the Dynamic E-Form Library below

Current Directory is : Approved_Forms   Current User Role is: 1000

Open Form:Quote_Approval_Form1000013.xfdl
Open Form:Quote_Approval_Form1000014.xfdl
Open Form:Quote_Approval_Form100001854.xfdl
Open Form:Quote_Approval_Form100002579.xfdl
Open Form:Quote_Approval_Form100004349.xfdl
Open Form:Quote_Approval_Form100006312.xfdl
Open Form:Quote_Approval_Form100007157.xfdl
Open Form:Quote_Approval_Form1000073.xfdl
Open Form:Quote_Approval_Form100014910.xfdl
Open Form:Quote_Approval_Form100015764.xfdl
Open Form:Quote_Approval_Form100020651.xfdl
Open Form:Quote_Approval_Form100024343.xfdl
Open Form:Quote_Approval_Form100025838.xfdl
Open Form:Quote_Approval_Form100026537.xfdl
Open Form:Quote_Approval_Form100027211.xfdl
Open Form:Quote_Approval_Form100028365.xfdl
Open Form:Quote_Approval_Form100029466.xfdl
Open Form:Quote_Approval_Form100030690.xfdl
Open Form:Quote_Approval_Form100031833.xfdl
Open Form:RedPaperForm1143563113031.xfdl

Home

...Yet another WTS Production!

Figure 5-138 Approved form listing view using dirlisting1.jsp

6

Building the base scenario: stage 2

In this chapter we extend the base J2EE scenario we created in Chapter 4, “Approaches to integrating Workplace Forms” on page 151. We now add a DB2 environment. The reason for this is to take into consideration the potential data growth and subsequent server performance implications when storing a huge amount of large XDFL files on the file system. Storing the forms in DB2 gives you scalability, reliability, and database search capabilities.

We describe the following topics:

- Installing DB2 clients and servers
- Creating and populating DB2 tables
- Developing a DB2 data access layer
- Creating data access functionality for DB2 data using XForms submissions
- Using the Workplace Forms API
- Creating JSPs to view DB2 data

Note: The code used for building this sample scenario application is available for download. For specific information about how to download the sample code, refer to Appendix D, “Additional material” on page 693.

Note: All specific examples shown and used when building the sample scenario application are based on the codebase for IBM Workplace Forms Release 2.6.1.

6.1 Overview of steps: building stage 2 of the base scenario

The diagram in Figure 6-1 is intended to provide an overview of where we are within the key steps involved to build stage 2 of the base scenario. This focuses on adding storage capabilities to DB2, incorporating Web services, modifying the JSPs, and adding an approval workflow.

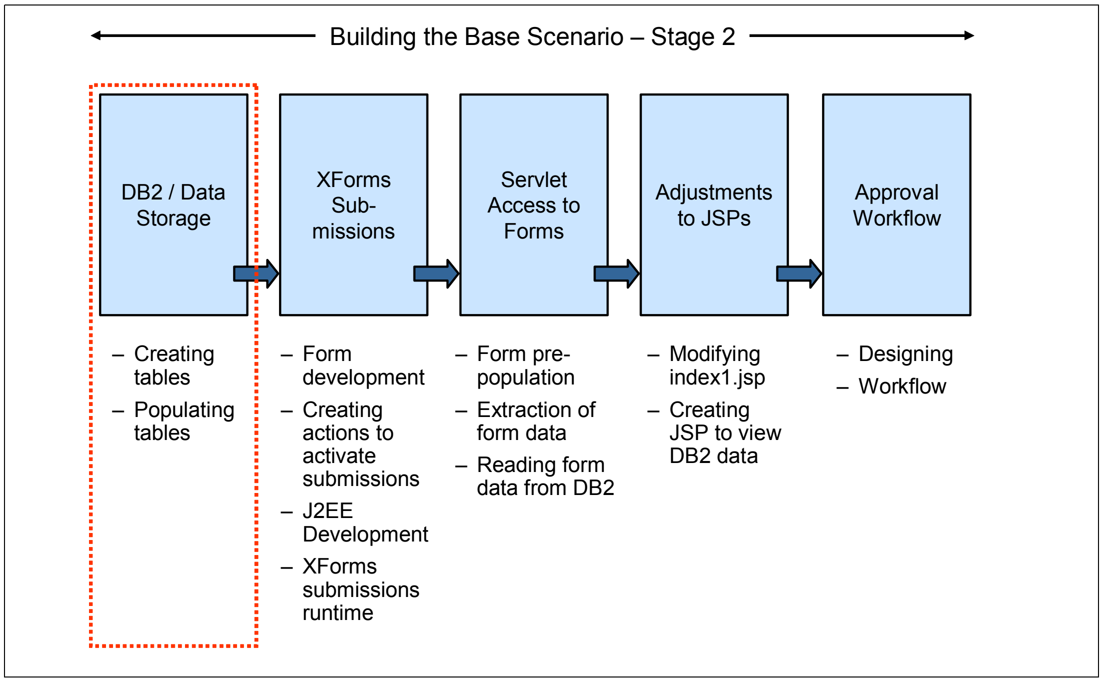


Figure 6-1 Overview of major steps involved in building stage 2 of base scenario application

6.2 Data storage to DB2

A main topic of stage 2 in building the sample application is moving the leading data storage to a relational database to take advantage of database search capabilities, scalability, and reliability. The following data should be available as SQL data for the project:

- Basic application parameters (such as business rules)
- Organization data (such as employee data, manager data)
- Inventory (such as product description, stock level)
- Customer registry (such as ID, name, related sales person)
- Order metadata (such as ID, name, submitting sales person)
- Order forms (complete XFDL files as CLOB)
- Counter for new order number

Due to the use of large data objects (XFDL files can reach the multiple megabyte size range), we decide to use a separate DB2 table for data storage. For each of the data objects mentioned above, there is one dedicated table holding all available data and one additional table to store the entire amount of submitted forms.

The data should be accessed using the Class 2 JDBC™ driver available in the install package.

Note: Access to CLOB/BLOB is not a JDBC standard. Nevertheless, the chosen JDBC driver supports these operations. Make sure that your driver/database combination will handle BLOB or CLOB objects when storing templates or submitted filed in a database. Forms containing one ore more megabytes are rarely used, but sometimes required.

6.2.1 Installing DB2 Server

All tables are assigned to one single database instance with a standard DB2 set up on a Windows 2003 server machine. We process a standard DB2 UDB 8.2 installation using the following setup parameters (Table 6-1).

Table 6-1 DB2 Universal Database™ setup parameters

Setup parameter	Parameter value	Comments
Setup type	Standard	Creates a DB2 instance and all necessary administration utilities (Control Center, command-line processor).
Instance name	DB2	Default instance name.
Instance node name	TCP8D534	Generated during setup.
Administration user	wpsadmin	Same user as portal/WebSphere Application Server (WAS) administrator.
Administration user password	wpsadmin	Be careful about user name and password. Setup will create a system account with full administration permissions. *Never* use any common known (default) passwords in production or sensitive environments here.
Maintenance mode	Low administration/low performance	Arbitrary - keep things simple for this project.
Admin notification mode	Defer	Arbitrary - keep things simple for this project.

After setup, we create a new DB2 database (Table 6-2).

Table 6-2 DB2 Universal Database setup parameters

Setup parameter	Parameter value	Comments
Database name	VMFORMS	
Database alias	VMFORMS	

All database tables necessary for the project are created in this database.

6.2.2 Creating tables

The project uses the tables listed in Table 6-3. (For detailed column attributes, see the table setup scripts in Example 6-1 on page 372 and Example 6-2 on page 375.)

Table 6-3 DB2 table descriptions

Table name	Column name	Comments
WPF_Param		Table containing administrative parameters, business rules, and other setup data on a key/value concept. To store numeric and text data, the table contains two parameter value columns dedicated to the two value types. No administration utilities to maintain data in the application. Use DB2 administration tools for data maintenance.
	Par_Key	Key value for parameter lookup.
	Par_NumValue	Numeric parameter value.
	Par_TextValue	Text string assigned to the parameter.
WPF_ORG		Organization data (employee data and reporting line). No administration utilities to maintain data in the application. Use DB2 administration tools for data maintenance.
	Org_ID	Employee ID (used as key and role identification).
	Org_FirstName	Employee first name.
	Org_LastName	Employee last name.
	Org_ContactInfo	Employee mail address or other contact data.
	Org_MGR	Managers ID - references to the Org_ID of any other employee.
WPF_CUST		Customer data (name, contact person data, and responsible sales person). No administration utilities to maintain data in the application. Use DB2 administration tools for data maintenance.
	CUST_ID	Customer company ID (unique key for data lookup).
	CUST_NAME	Company name.
	CUST_AMGR	ID of responsible sales person/ Related or column ORG_ID in table WPR_ORG.
	CUST_CONTACT_NAME	Name of contact person on customer site.
	CUST_CONTACT_POSITION	Position of contact person on customer site.
	CUST_CONTACT_EMAIL	E-mail address of contact person on customer site.
	CUST_CONTACT_PHONE	Phone number of contact person on customer site.
	CUST_CRM_NO	ID for the customer in the local CRM system.

Table name	Column name	Comments
WPF_ITEMS		Product catalog used for product lookup. No administration utilities to maintain data in the application. Use DB2 administration tools for data maintenance.
	IT_ID	Item ID (used for item details lookup).
	IT_NAME	Item name (short item description).
	IT_PRICE	Item price per unit.
	IT_STOCK	Stock availability.
WPF_ORDERS		Table storing active and archived order metadata - the application reads data for list display/order selection and writes/updates data on form submit.
	ORD_ID	Order ID (unique) used for data lookup.
	ORD_CUST_ID	Customer ID for the related order.
	ORD_AMOUNT	Total order amount.
	ORD_DISCOUNT	Total order discount.
	ORD_SUBMITTER_ID	ID of the sales person creating this order (related to field ORG_ID in table WPF_ORG).
	ORD_STATE	Order state: 1 - new order not processed yet 2 - order waiting for manager approval 3 - order waiting for director approval 4 - completed (finally accepted) order 5 - rejected order waiting for rework 6 - canceled order
	ORD_CREATION_DATE	Order creation date.
	ORD_COMPLETION_DATE	Order completion date.
	ORD_OWNER	ID for the actual owner (sales person) for the owner. Initial the submitting same person (related to field ORG_ID in table WPF_ORG).
	ORD_VERSION	Order version - the version number of the order form used.
	ORD_APP_1	ID of approving manager (related to field ORG_ID in table WPF_ORG).
	ORD_APP_DATE_1	Date of manager approval.
	ORD_APP_COMMENT_	Comment for manager approval.
	ORD_APP_2	ID of approving director (related to field ORG_ID in table WPF_ORG).
	ORD_APP_DATE_2	Date of director approval.
	ORD_APP_COMMENT_2	Comment for director approval.

Table name	Column name	Comments
WPF_ORDXFDL		Table storing the entire XFDL form containing detail order information and signing information. Each record related to a corresponding order metadata record stored in table WPF_ORDERS with the same order ID. The application reads data for on form open and writes/updates data on form submit.
	ORD_ID	Order ID (unique) used for data lookup relates to order metadata in table WPF_ORDERS by same ORD_ID.
	ORD_XFDL	CLOB field (1 MB maximum) to store entire XFDL file.
WPF_ORDNOCNT		Counter for new order numbers.
	ORD_ID	Last used order number - will increase by 1 for each new order.

Tip: To avoid multi-megabyte CLOB column definitions used for form storage, the read/write routines could join/split the entire file into smaller blocks stored in consecutive records. This technique could help to overcome database or driver limitations, but would result in a somewhat lower performance in general.

Note: There is no DB2-based repository for available XFDL templates in our project. These files could be stored in DB2 similar to the submitted forms. We do not take this approach due to development time limitations. We save time on development for special (template) file upload and maintenance facilities using file system storage as in the stage 1 scenario.

At the beginning of the project, these tables are created using the DB2 command-line processor on the server machine with the SQL script given in Example 6-1.

Example 6-1 DB2 table creation script

```
connect to WPFORMS user wpsadmin using wpsadmin
;
DROP TABLE WPF_PARAM;
DROP TABLE WPF_ORG;
DROP TABLE WPF_CUST;
DROP TABLE WPF_ITEMS;
DROP TABLE WPF_ORDERS;
DROP TABLE WPF_ORDXFD;
DROP TABLE WPF_ORDNOCNT;



CREATE  TABLE WPF_Param  (
   Par_Key VARCHAR (20) NOT NULL DEFAULT  ,
   Par_NumValue DECIMAL (10,2)   ,
   Par_TextValue VARCHAR (100) DEFAULT  ,
PRIMARY KEY (PAR_KEY)
);
 select * from WPF_Param;
```

```
CREATE  TABLE WPF_ORG  (
   Org_ID VARCHAR (10) NOT NULL DEFAULT  ,
   Org_FirstName VARCHAR (30) NOT NULL DEFAULT  ,
   Org_LastName VARCHAR (30) NOT NULL DEFAULT  ,
   Org_ContactInfo VARCHAR (100) NOT NULL DEFAULT  ,
   Org_MGR VARCHAR (10) NOT NULL  ,
PRIMARY KEY (ORG_ID)
);
 select * from WPF_ORG;




CREATE  TABLE WPF_CUST  (
   CUST_ID VARCHAR (10) NOT NULL DEFAULT  ,
   CUST_NAME VARCHAR (30) NOT NULL DEFAULT  ,
   CUST_AMGR VARCHAR (10) NOT NULL DEFAULT  ,
   CUST_CONTACT_NAME VARCHAR (30) NOT NULL DEFAULT  ,
   CUST_CONTACT_POSITION VARCHAR (30) NOT NULL DEFAULT  ,
   CUST_CONTACT_EMAIL VARCHAR (50) NOT NULL DEFAULT  ,
   CUST_CONTACT_PHONE VARCHAR (20) NOT NULL DEFAULT  ,
   CUST_CRM_NO VARCHAR (10) NOT NULL DEFAULT  ,
PRIMARY KEY (CUST_ID)
);
 select * from WPF_CUST;




CREATE  TABLE WPF_ITEMS  (
   IT_ID VARCHAR (10) NOT NULL DEFAULT  ,
   IT_NAME VARCHAR (30) NOT NULL DEFAULT  ,
   IT_PRICE DECIMAL (10,2) NOT NULL DEFAULT  ,
   IT_STOCK INTEGER  NOT NULL DEFAULT  0,
PRIMARY KEY (IT_ID)
);
 select * from WPF_ITEMS;




CREATE  TABLE WPF_ORDERS  (
   ORD_ID VARCHAR (10) NOT NULL  ,
   ORD_CUST_ID VARCHAR (10) DEFAULT  '',
   ORD_AMOUNT DECIMAL (10,2) DEFAULT 0,
   ORD_DISCOUNT DECIMAL (10,2) DEFAULT 0,
   ORD_SUBMITTER_ID VARCHAR (10)   ,
   ORD_STATE VARCHAR (10) DEFAULT  '',
   ORD_CREATION_DATE DATE    ,
   ORD_COMPLETION_DATE DATE    ,
   ORD_OWNER VARCHAR (10) DEFAULT  '1.0',
   ORD_VERSION VARCHAR (10) DEFAULT  '1.0',
   ORD_APP_1 VARCHAR (10) DEFAULT '',
   ORD_APP_DATE_1 DATE    ,
   ORD_APP_COMMENT_1 VARCHAR (200) DEFAULT '',
   ORD_APP_2 VARCHAR (10) DEFAULT '',
   ORD_APP_DATE_2 DATE    ,
   ORD_APP_COMMENT_2 VARCHAR (200) DEFAULT '',
PRIMARY KEY (ORD_ID)
);
 select * from WPF_ORDERS;


CREATE  TABLE WPF_ORDXFD  (
   ORD_ID VARCHAR (10) NOT NULL  ,
   ORD_XFDL CLOB (1000000) DEFAULT  '',
PRIMARY KEY (ORD_ID)
);
 select * from WPF_ORDXFD;


CREATE  TABLE WPF_ORDNOCNT  (
   ORD_ID VARCHAR (10) NOT NULL  ,
PRIMARY KEY (ORD_ID)
);
 select * from WPF_ORDXFD;


SELECT COUNT (*) FROM WPF_Param ;
SELECT COUNT (*) FROM WPF_ORG ;
SELECT COUNT (*) FROM WPF_CUST ;
SELECT COUNT (*) FROM WPF_ITEMS ;
SELECT COUNT (*) FROM WPF_ORDERS ;
SELECT COUNT (*) FROM WPF_ORDXFD ;
SELECT COUNT (*) FROM WPF_ORDNOCNT ;

SELECT * FROM WPF_Param ;
SELECT * FROM WPF_ORG ;
SELECT * FROM WPF_CUST ;
SELECT * FROM WPF_ITEMS ;
SELECT * FROM WPF_ORDERS ;
SELECT * FROM WPF_ORDXFD ;
SELECT * FROM WPF_ORDNOCNT ;
```

The script initially deletes all used tables (DROP statements) to have a simple redeployment whenever tables or example data changes.

Next, all tables are created (CREATE statements). Finally, all tables are read to have an easy way to see if any error occurred during setup (SELECT statements).

Tip: This procedure is really helpful when deploying large database structures with multiple dependencies between tables, views, and stored procedures. The created structure is simple. To keep code, installation, and documentation as simple as possible, we do not set up any relational references or special lookup views inheriting related data. In reality, there are various interdependencies between the data structures, making setup validation a mandatory task.

6.2.3 Populating tables

To have a manageable project start, we fill the tables with example data. This makes it easy to design all read-only functionality (Web services, table display JSPs, prepopulation functionality) independent of any data creating modules. These are usually created in more advanced project phases.

Initial data population is done using the script shown in Example 6-2 right after table creation. (INSERT statements create one table row, SELECT statements return the inserted data for error detection.)

Example 6-2 Example of data prepopulation to DB2 tables

```
INSERT INTO WPF_Param (Par_Key, Par_NumValue, Par_TextValue) VALUES ('MgrThreshold', 10000,
'Manager Approval Threshold');
INSERT INTO WPF_Param (Par_Key, Par_NumValue, Par_TextValue) VALUES ('DirThreshold', 50000,
'Director Approval Threshold');
INSERT INTO WPF_Param (Par_Key, Par_NumValue, Par_TextValue) VALUES ('Discount_1', 10,
'Rabate 1 in percent');
INSERT INTO WPF_Param (Par_Key, Par_NumValue, Par_TextValue) VALUES ('Discount_2', 20,
'Rabate 2 in percent');
INSERT INTO WPF_Param (Par_Key, Par_NumValue, Par_TextValue) VALUES ('Discount_3', 30,
'Rabate 3 in percent');

SELECT * FROM WPF_Param;


INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1000', 'Christine', 'Haas', '1000.Christine.Haas@ACME.cam.itso.ibm.com', '1010');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1001', 'Michael', 'Thompson', '1001.Michael.Thompson@ACME.cam.itso.ibm.com', '1010');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1002', 'Sally', 'Kwan', '1002.Sally.Kwan@ACME.cam.itso.ibm.com', '1010');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1003', 'John', 'Geyer', '1003.John.Geyer@ACME.cam.itso.ibm.com', '1010');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1004', 'Irving', 'Stern', '1004.Irving.Stern@ACME.cam.itso.ibm.com', '1010');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1005', 'Eva', 'Pulaski', '1005.Eva.Pulaski@ACME.cam.itso.ibm.com', '1010');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1006', 'Eileen', 'Henderson', '1006.Eileen.Henderson@ACME.cam.itso.ibm.com', '1010');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1007', 'Theodore', 'Spenser', '1007.Theodore.Spenser@ACME.cam.itso.ibm.com', '1010');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1008', 'Vincenzo', 'Lucchessi', '1008.Vincenzo.Lucchessi@ACME.cam.itso.ibm.com', '1010');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1009', 'Sean', 'Connell', '1009.Sean.Connell@ACME.cam.itso.ibm.com', '1010');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1010', 'Dolores', 'Quintana', '1010.Dolores.Quintana@ACME.cam.itso.ibm.com', '1031');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1011', 'Heather', 'Nicholls', '1011.Heather.Nicholls@ACME.cam.itso.ibm.com', '1020');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1012', 'Bruce', 'Adamson', '1012.Bruce.Adamson@ACME.cam.itso.ibm.com', '1020');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1013', 'Elizabeth', 'Pianka', '1013.Elizabeth.Pianka@ACME.cam.itso.ibm.com', '1020');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1014', 'Masatoshi', 'Yoshimura', '1014.Masatoshi.Yoshimura@ACME.cam.itso.ibm.com',
'1020');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1015', 'Marilyn', 'Scoutten', '1015.Marilyn.Scoutten@ACME.cam.itso.ibm.com', '1020');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1016', 'James', 'Walker', '1016.James.Walker@ACME.cam.itso.ibm.com', '1020');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1017', 'David', 'Brown', '1017.David.Brown@ACME.cam.itso.ibm.com', '1020');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1018', 'William', 'Jones', '1018.William.Jones@ACME.cam.itso.ibm.com', '1020');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1019', 'Jennifer', 'Lutz', '1019.Jennifer.Lutz@ACME.cam.itso.ibm.com', '1020');
```

```
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1020', 'James', 'Jefferson', '1020.James.Jefferson@ACME.cam.itso.ibm.com', '1031');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1021', 'Salvatore', 'Marino', '1021.Salvatore.Marino@ACME.cam.itso.ibm.com', '1030');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1022', 'Daniel', 'Smith', '1022.Daniel.Smith@ACME.cam.itso.ibm.com', '1030');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1023', 'Sybil', 'Johnson', '1023.Sybil.Johnson@ACME.cam.itso.ibm.com', '1030');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1024', 'Maria', 'Perez', '1024.Maria.Perez@ACME.cam.itso.ibm.com', '1030');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1025', 'Ethel', 'Schneider', '1025.Ethel.Schneider@ACME.cam.itso.ibm.com', '1030');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1026', 'John', 'Parker', '1026.John.Parker@ACME.cam.itso.ibm.com', '1030');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1027', 'Philip', 'Smith', '1027.Philip.Smith@ACME.cam.itso.ibm.com', '1030');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1028', 'Maude', 'Setright', '1028.Maude.Setright@ACME.cam.itso.ibm.com', '1030');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1029', 'Ramlal', 'Mehta', '1029.Ramlal.Mehta@ACME.cam.itso.ibm.com', '1030');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1030', 'Wing', 'Lee', '1030.Wing.Lee@ACME.cam.itso.ibm.com', '1031');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('1031', 'Jason', 'Gounot', '1031.Jason.Gounot@ACME.cam.itso.ibm.com', '1031');
INSERT INTO WPF_ORG (Org_ID, Org_FirstName, Org_LastName, Org_ContactInfo, Org_MGR) VALUES
('wpsadmin', 'Admin', 'Portal&WAS', 'wpsadmin@ACME.cam.itso.ibm.com', '1031');

SELECT * FROM WPF_ORG;


INSERT INTO WPF_CUST (CUST_ID, CUST_NAME, CUST_AMGR, CUST_CONTACT_NAME,
CUST_CONTACT_POSITION, CUST_CONTACT_EMAIL, CUST_CONTACT_PHONE, CUST_CRM_NO) VALUES
('100000', 'OnDemand Corporation', '1000', 'Jerry Haas', 'AccountMgr',
'Jerry.Haas@OnDemand.oom', '+49 89 123-456-78', '200001');
INSERT INTO WPF_CUST (CUST_ID, CUST_NAME, CUST_AMGR, CUST_CONTACT_NAME,
CUST_CONTACT_POSITION, CUST_CONTACT_EMAIL, CUST_CONTACT_PHONE, CUST_CRM_NO) VALUES
('100001', 'Workplace Early Adopter Inc', '1000', 'Mary F Thompson', 'DeptMgr',
'Mary.F.Thompson@Workplace-Early-Adopter.com', '1 756-568-123', '200002');
INSERT INTO WPF_CUST (CUST_ID, CUST_NAME, CUST_AMGR, CUST_CONTACT_NAME,
CUST_CONTACT_POSITION, CUST_CONTACT_EMAIL, CUST_CONTACT_PHONE, CUST_CRM_NO) VALUES
('100002', 'Portal Application Surfacing', '1001', 'Hiu Kwan', 'Director',
'Hiu.Kwan@p-app.surf.org', '+43 623-644', '200003');
INSERT INTO WPF_CUST (CUST_ID, CUST_NAME, CUST_AMGR, CUST_CONTACT_NAME,
CUST_CONTACT_POSITION, CUST_CONTACT_EMAIL, CUST_CONTACT_PHONE, CUST_CRM_NO) VALUES
('100003', 'Workplace Forms Redpapers Inc', '1001', 'Max Ritter', 'AccountMgr',
'Max.Ritter@wpfrp.ibm.com', '1 756-123-456', '200004');
INSERT INTO WPF_CUST (CUST_ID, CUST_NAME, CUST_AMGR, CUST_CONTACT_NAME,
CUST_CONTACT_POSITION, CUST_CONTACT_EMAIL, CUST_CONTACT_PHONE, CUST_CRM_NO) VALUES
('100004', 'Global Security Trust Center Inc', '1001', 'Toni Tester', 'DeptMgr',
'Toni.Tester@gstc.de', '1 756-568-124', '200005');
INSERT INTO WPF_CUST (CUST_ID, CUST_NAME, CUST_AMGR, CUST_CONTACT_NAME,
CUST_CONTACT_POSITION, CUST_CONTACT_EMAIL, CUST_CONTACT_PHONE, CUST_CRM_NO) VALUES
('100005', 'Mobile Devices Corporation', '1002', 'Monique Lille', 'Director',
'Monique.Lille@md-corp.fr', '1 756-568-125', '200006');

SELECT * FROM WPF_CUST;


INSERT INTO WPF_ITEMS (IT_ID, IT_NAME, IT_PRICE, IT_STOCK) VALUES ('IT_001', 'Nut', 21.15,
11111);
```

```
INSERT INTO WPF_ITEMS (IT_ID, IT_NAME, IT_PRICE, IT_STOCK) VALUES ('IT_002', 'Bolt', 30.00,
22222);
INSERT INTO WPF_ITEMS (IT_ID, IT_NAME, IT_PRICE, IT_STOCK) VALUES ('IT_003', 'Widget',
512.99, 33333);
INSERT INTO WPF_ITEMS (IT_ID, IT_NAME, IT_PRICE, IT_STOCK) VALUES ('IT_004', 'Gadget',
12345, 44444);
INSERT INTO WPF_ITEMS (IT_ID, IT_NAME, IT_PRICE, IT_STOCK) VALUES ('IT_005', 'Thingy',
5000, 55555);

SELECT * FROM WPF_ITEMS;


INSERT INTO WPF_ORDERS (ORD_ID, ORD_CUST_ID, ORD_AMOUNT, ORD_DISCOUNT, ORD_SUBMITTER_ID,
ORD_STATE, ORD_CREATION_DATE, ORD_COMPLETION_DATE, ORD_OWNER, ORD_VERSION, ORD_APP_1,
ORD_APP_DATE_1, ORD_APP_COMMENT_1, ORD_APP_2, ORD_APP_DATE_2, ORD_APP_COMMENT_2) VALUES
('10000', '100001', 1000, 0, '1000', 'SUBMITTED', '2006-03-01', '9999-12-31', '1000',
'01.0', NULL, NULL, '1000', NULL, NULL, NULL);
INSERT INTO WPF_ORDERS (ORD_ID, ORD_CUST_ID, ORD_AMOUNT, ORD_DISCOUNT, ORD_SUBMITTER_ID,
ORD_STATE, ORD_CREATION_DATE, ORD_COMPLETION_DATE, ORD_OWNER, ORD_VERSION, ORD_APP_1,
ORD_APP_DATE_1, ORD_APP_COMMENT_1, ORD_APP_2, ORD_APP_DATE_2, ORD_APP_COMMENT_2) VALUES
('10001', '100002', 2000, 10, '1002', 'APPROVED1', '2006-03-02', '9999-12-31', '1010',
'01.0', 'APPROVED', '2006-03-02', '2000', 'APPROVED', NULL, NULL);
INSERT INTO WPF_ORDERS (ORD_ID, ORD_CUST_ID, ORD_AMOUNT, ORD_DISCOUNT, ORD_SUBMITTER_ID,
ORD_STATE, ORD_CREATION_DATE, ORD_COMPLETION_DATE, ORD_OWNER, ORD_VERSION, ORD_APP_1,
ORD_APP_DATE_1, ORD_APP_COMMENT_1, ORD_APP_2, ORD_APP_DATE_2, ORD_APP_COMMENT_2) VALUES
('10002', '100003', 3000, 20, '1021', 'APPROVED2', '2006-03-03', '9999-12-31', '1020',
'01.0', 'APPROVED', '2006-03-03', '3000', 'APPROVED', '2006-03-03', NULL);
INSERT INTO WPF_ORDERS (ORD_ID, ORD_CUST_ID, ORD_AMOUNT, ORD_DISCOUNT, ORD_SUBMITTER_ID,
ORD_STATE, ORD_CREATION_DATE, ORD_COMPLETION_DATE, ORD_OWNER, ORD_VERSION, ORD_APP_1,
ORD_APP_DATE_1, ORD_APP_COMMENT_1, ORD_APP_2, ORD_APP_DATE_2, ORD_APP_COMMENT_2) VALUES
('10003', '100002', 4000, 30, '1000', 'COMPLETED', '2006-03-04', '2006-03-17', '1031',
'01.0', 'APPROVED', '2006-03-04', NULL, 'APPROVED', '2006-03-04', NULL);
INSERT INTO WPF_ORDERS (ORD_ID, ORD_CUST_ID, ORD_AMOUNT, ORD_DISCOUNT, ORD_SUBMITTER_ID,
ORD_STATE, ORD_CREATION_DATE, ORD_COMPLETION_DATE, ORD_OWNER, ORD_VERSION, ORD_APP_1,
ORD_APP_DATE_1, ORD_APP_COMMENT_1, ORD_APP_2, ORD_APP_DATE_2, ORD_APP_COMMENT_2) VALUES
('10004', '100001', 5000, 0, '1000', 'REJECTED', '2006-03-05', '9999-12-31', '1010',
'01.0', 'REJECTED', NULL, NULL, NULL, NULL, NULL);
INSERT INTO WPF_ORDERS (ORD_ID, ORD_CUST_ID, ORD_AMOUNT, ORD_DISCOUNT, ORD_SUBMITTER_ID,
ORD_STATE, ORD_CREATION_DATE, ORD_COMPLETION_DATE, ORD_OWNER, ORD_VERSION, ORD_APP_1,
ORD_APP_DATE_1, ORD_APP_COMMENT_1, ORD_APP_2, ORD_APP_DATE_2, ORD_APP_COMMENT_2) VALUES
('10005', '100002', 6000, 0, '1002', 'CANCELED', '2006-03-06', '9999-12-31', '1010',
'01.0', NULL, NULL, NULL, NULL, NULL, NULL);

SELECT * FROM WPF_ORDERS;


INSERT INTO WPF_ORDXFD (ORD_ID, ORD_XFDL) VALUES ('10000', NULL);
INSERT INTO WPF_ORDXFD (ORD_ID, ORD_XFDL) VALUES ('10001', NULL);
INSERT INTO WPF_ORDXFD (ORD_ID, ORD_XFDL) VALUES ('10002', NULL);
INSERT INTO WPF_ORDXFD (ORD_ID, ORD_XFDL) VALUES ('10003', NULL);
INSERT INTO WPF_ORDXFD (ORD_ID, ORD_XFDL) VALUES ('10004', NULL);
INSERT INTO WPF_ORDXFD (ORD_ID, ORD_XFDL) VALUES ('10005', NULL);

SELECT * FROM WPF_ORDXFD;


INSERT INTO WPF_ORDNOCNT (ORD_ID) VALUES ('1000000');

SELECT * FROM WPF_ORDNOCNT;
```

The available sample data is adjusted to project needs in iterative steps. Each step results in a new table setup and table example data population.

The life cycle of this data differs for the various objects:

- Sample order data (data in Table WPF_ORDERS and WPF_ORDXFDL) is not complete. (We do not store XFDL files as sample data.) After creating the first full orders in stage 2, we delete the initial example data in WPF_ORD table to avoid exceptions when opening orders with missing form data.
- Organization data, product catalog, and project parameters (Tables WPF_ORG, WPF_ORD, WPF_PARAM) stay unchanged during the project development. Maintenance routines for these tables are out of scope for this project.

6.2.4 Installing DB2 clients on development clients and servers

In this section we describe the installation of DB2 clients on the development systems.

Development workstations

Each developer testing DB2-related code needs to run a DB2 client on the local workstation to work with the JDBC driver used in the project:

- Servlet development for data prepopulation and data storage on new order or order submit events
- JSP development showing available order lists based on data stored in DBs
- Web service provider development

Therefore, we install on those workstations a DB2 client and DB2 Control Center to have a convenient setup for the necessary database registration. There are various ways to register the database to the client. We use DB2 Control Center wizards. Make sure to assign the same alias to the database on client registration as used on the server, because the code runs using a fixed server name database and alias to identify the connection.

Workstations used for Workplace Forms (XFDL/XForms) development and end-user tests do not need a DB2 client installation.

Production servers

In a distributed environment, the following servers need to install a DB2 client and register the target database:

- WebSphere/Tomcat Application Server running the created servlet and JSPs
- WebSphere/Tomcat Application Server running the Web service provider applications

In our project, one server machine handles all server tasks (DB2 Server, Web Service provider, application server, http server). That is why we do not install additional DB2 clients on remote servers in this project.

6.2.5 Developing the data access layer (DB2)

To make parallel development of different components possible from start up — without time to develop a sophisticated data model — we decide to make interfaces between parallel tracks as flexible as possible.

Two basic assumptions are made:

- Design interfaces are only based on simple Java data types (String, String[], and String[][]) and XML fragments generated based on DB2 table data. This saves a lot of time, which is usually necessary for modelling interface data objects.
- No publishing is done on internal DB2 artifacts (table gnomon, column names, queries) outside the DB2 data access layer to reduce impact on any changes in DB2 structures, queries, and so on, on the business logic and presentation layer.

These presumptions lead to a simple 2-layer concept for basic data access, resulting in a 2-level Java library (WPFormsDBsConnectionT) with the following functionality:

- Class DB2Connection for basic DB2 connectivity:
  - Open connection.
  - Read row data.
  - Insert row data.
  - Update row data.

  This module is only accessed by the access by modules in DB2ConnectionForms. The available methods, in general, accept input data formed as a valid SQL query and return output as simple strings or string arrays.
- Class DB2ConnectionForms exposes an easy-to-use and robust interface for business logic modules abstracting from table and field names, and creates for each data object the corresponding read/write operations as dedicated methods. In most of the cases, reading or writing data can be reduced to a *one-liner* in the higher level application functionality.

Procedures for opening and closing the JDBC connection are shown in Example 6-3.

Example 6-3 Basic JDBC routines for opening and closing a connection

```
/*
 * Created on Mar 10, 2006
 *
 * Basic DB2 Connection routines using a level 2 driver
 * db2java.zip / db2java.jar from DB2 8.2 UDB release
 */
package forms.cam.itso.ibm.com;

import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.PreparedStatement;
import java.sql.ResultSet;
import java.sql.SQLException;
import java.sql.Statement;


/**
 * @author Andreas Richter ISSL
 *
 * application independent db2 calls (NO table and column namens here)
 *
 */
public class DB2Connection {

   /**
    * Comment for <code>db2con</code> application independent db2 calls (NO
    * table and column namens)
    */
   //connection ebject
```

```
    private static Connection db2con;

    // For local tests set this attribute in the calling code like this:
    //DB2Connection.env = "LocalTestEnvironment"
    // For productonnuse specify an empty string
    public static String env = "";

    /* Generic procedures */

    /**
     * create a jdbc connection
     */
    public static void connect() {

       //set connection credencials
       String driver = "COM.ibm.db2.jdbc.app.DB2Driver"; //$NON-NLS-1$
       String url = Messages.getString("DB2_ulr"); //$NON-NLS-1$
       String user = Messages.getString("DB2_username"); //$NON-NLS-1$
       String password = Messages.getString("DB2_password"); //$NON-NLS-1$

       // overwrite values for local test-environment
       if (env.equals("LocalTestEnvironment")) { //$NON-NLS-1$
          user = "Administrator"; //$NON-NLS-1$
          password = "admin"; //$NON-NLS-1$
          url = "jdbc:db2:WPFORMS1"; //$NON-NLS-1$
       }

       //initiate connection object
       db2con = null;

       try {
          // Load the DB2 JDBC Type 2 Driver with DriverManager
          Class.forName(driver);
          //System.out.println("Driver found: " + driver); //$NON-NLS-1$
       } catch (ClassNotFoundException e) {
          e.printStackTrace();
          System.out.println("Driver not found:" + driver); //$NON-NLS-1$
          db2con = null;
       }

       //open the connection
       try {
          db2con = DriverManager.getConnection(url, user, password);
          //in real life set it to false and use commit method after write
          // operations
          db2con.setAutoCommit(true);
          //System.out.println("Connected: " + url); //$NON-NLS-1$
       } catch (SQLException e1) {
          System.out.println("NOT Connected " + url + " User: " + user //$NON-NLS-1$
//$NON-NLS-2$
                + " pw: " + password); //$NON-NLS-1$
          e1.printStackTrace();
          //try to reconnect
          if (db2con != null) {
             try {
                db2con.close();
                db2con = DriverManager.getConnection(url, user, password);
                db2con.setAutoCommit(true);
             } catch (SQLException e2) {
                // TODO Auto-generated catch block
                System.out.println("no connection: " + url); //$NON-NLS-1$
             }
          }
          //no connection - clear object
          db2con = null;
       }
    }

    /**
     * commit method
     */
    public static void commit() {
       try {
          db2con.commit();
       } catch (SQLException e) {
          // TODO Auto-generated catch block
          e.printStackTrace();
       }
    }

    /**
     * close connection
     */
    public static void disconnect() {
       try {
          db2con.close();
       } catch (SQLException e1) {
          System.out.println("could not close connection");
       }
    }

    // Data retrieval routines


// .....
}
```

Example 6-4 is an example for the property file we use.

Example 6-4 File db2connection.properties

```
DB2_ulr=jdbc:db2:wpforms
DB2_username=wpsadmin
DB2_password=wpsadmin
```

For read-only connections, we use statement-oriented methods, submitting a query such as:

```
SELECT <variables> FROM <tablename> WHERE <selection criterion>
```

A basic call always looks like Example 6-5.

Example 6-5 Example method to read one-column value

```
package forms.cam.itso.ibm.com;

import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.PreparedStatement;
import java.sql.ResultSet;
import java.sql.SQLException;
import java.sql.Statement;

public class DB2Connection {

.....

/**
    * get a specific field from a table row by sql query *
    *
    * @param query
    *            valid sql query for read (SELECT ...)
    * @return field value as String
    */
   public static String getField(String query) {
      String result = "";
      Statement stmt;
      ResultSet rs = null;

      //open the connection
      DB2Connection.connect();

      try {
         //execute query
         stmt = db2con.createStatement(); // Create a Statement object
         rs = stmt.executeQuery(query);

         //read result as string
         result = "";
         try {
            rs.next();
            result = rs.getString(1); // Retrieve
            rs.close(); // Close the ResultSet
            stmt.close();
         } catch (SQLException e2) {
            // TODO Auto-generated catch block
            //e2.printStackTrace();
            System.out.println("No results: " + query);
            result = "";
         }
      } catch (SQLException e) {
         e.printStackTrace();
         result = e.toString();
      } finally {
         //always disconnect
         DB2Connection.disconnect();
      }
      return result;

   }

....
}
```

Reading and writing Character Large Objects (CLOBs), used to retrieve and store complete XFDL documents, is not contained in the JDBC standard. Nevertheless, it can be done with the chosen JDBC driver. To read CLOBs, we can use the getField method above. To insert and update CLOBS, we use a driver-specific method, which may not work on other drivers (Example 6-6).

Example 6-6 Writing/inserting Character Large Objects (CLOBs)

```
   /**
    *
    * Updates (or inserts) a clob field This method is NOT jdbc standard and
    * can fail depending on the used driver If the assigned row does not exist,
    * a new entry is created. If the assigned row exists, the clob is updated
    *
    * @param tableName
    *           table name to insert
    * @param id
    *           id (key field value)
    * @param id_field
    *           key field name
    * @param clob
    *           clob value
    * @param clob_field
    *           field name for clob
    */
   public static void updateCLOB(String tableName, String id, String id_field,
         String clob, String clob_field) {

      PreparedStatement stmt;
      ResultSet rs = null;
      String query = "";

      //connect
      DB2Connection.connect();
      //System.out.println("UPDATE CLOB: " + id);
      try {
         //creare query
         query = "UPDATE " + tableName + " SET (" + clob_field + ") = (?) WHERE " +
id_field + " = '" + id + "'";
         stmt = db2con.prepareStatement(query); // Create a Statement object
         //assign clob value
         stmt.setString(1, clob);
         //update
         stmt.execute();
         db2con.commit();
         //close
         stmt.close();

      } catch (SQLException e) {
         // TODO Auto-generated catch block
         e.printStackTrace();
      } finally {
         //close connection
         DB2Connection.disconnect();
      }

   }
```

To meet forms-specific needs in data prepopulation (assigning multiple values to an XFDL data instance (for example, complete employee data or customer data)), we implement a generic function (getResultsXML) that returns one or more rows of an SQL table rendered as XML instances. The implemented code is shown in Example 6-7.

Example 6-7 Returning data structures as XML instances

```
   /**
    *
    * execute a query and return data rendered as xml string (convert all data
    * to string) tag names for data entties are created from column names tag
    * names for rows are created from tagInstance parameter
    *
    * @param query
    *           valid sql query
    * @param rowElement
    *           tag name for the xml instance to create
    * @return xml instance like this <rowElement><column1>val </column1>
    *         <column2>val </column2> <column3>val </column3> ... <columnN>val
    *         </columnN> </rowElement> .... <rowElement sid=X> <column1>val
    *         </column1> <column2>val </column2> <column3>val </column3> ...
    *         <columnN>val </columnN> </rowElement>
    *
    */
   public static String getResultsXML(String query, String rowElement, int maxresults) {
      Statement stmt;
      String resultXML = ""; //$NON-NLS-1$
      String resultXMLrow = ""; //$NON-NLS-1$
      ResultSet rs = null;
      p("getResultsXML: " + query);
      int row = 0;
      p(query);
      try {
         // connect
         connect();

         // execute query
         stmt = db2con.createStatement(); // Create a Statement object
         rs = stmt.executeQuery(query);
         // get column number (need for row fetch)
         int cols = rs.getMetaData().getColumnCount();
         rs = stmt.executeQuery(query);
         // read data and create xml
         try {
            while (rs.next() && (row < maxresults)) { // Position the cursor
               row++;
               resultXMLrow = ""; //$NON-NLS-1$
               for (int col = 0; col < cols; col++) {
                  // add result to row data
                  resultXMLrow = resultXMLrow
                  + createTag(
                        rs.getString(col + 1), rs.getMetaData().getColumnName(col + 1),
                  "");
               }
               // add row to return string
               if (! rowElement.equals("")){
                  resultXML = resultXML+ createTag("\n" + resultXMLrow, rowElement, "");
//$NON-NLS-1$
               } else {
                  resultXML = resultXML+ resultXMLrow;
               }
            }
            rs.close(); // Close the ResultSet
            stmt.close();
         } catch (SQLException e2) {
            // TODO Auto-generated catch block
            e2.printStackTrace();
         }

      } catch (SQLException e) {
         e.printStackTrace();
      } finally {
         // always colde connection
         disconnect();
      }
      p("Results: " + resultXML);
      return resultXML;

   }

/**
 *
 * helper method to create an xml tags from a value
 *
 * @param tagData
 *         data to include
 * @param tagName
 *         name of the tag
 * @param attributes
 *         opt. additional attributes
 *
 * @return String containing xml represenatation of the query
 */
private static String createTag(String tagData, String tagName,
String attributes) {
String tag = ""; //$NON-NLS-1$
if (attributes.equals("")) {
tag = tag + "<" + tagName + ">"; //$NON-NLS-1$ //$NON-NLS-2$
} else {
tag = tag + "<" + tagName + " " + attributes + ">"; //$NON-NLS-1$ //$NON-NLS-2$
}
tag = tag + tagData;
tag = tag + "</" + tagName + ">" + "\n"; //$NON-NLS-1$ //$NON-NLS-2$ //$NON-NLS-3$
return tag;
}
```

A call to that method, with the following parameters, returns a string, as shown in Example 6-8:

```
getResultsXML("Select * from WPF_ORG","employee")
```

*Example 6-8 Resulting XML fragment for query “"Select * from WPF_ORG"“*

```
<employee>
   <ORG_ID>1000</ORG_ID>
   <ORG_FIRSTNAME>Christine</ORG_FIRSTNAME>
   <ORG_LASTNAME>Haas</ORG_LASTNAME>
   <ORG_CONTACTINFO>1000.Christine.Haas@ACME.cam.itso.ibm.com</ORG_CONTACTINFO>
   <ORG_MGR>1010</ORG_MGR>
</employee>
<employee>
   <ORG_ID>1001</ORG_ID>
   <ORG_FIRSTNAME>Michael</ORG_FIRSTNAME>
   <ORG_LASTNAME>Thompson</ORG_LASTNAME>
   <ORG_CONTACTINFO>1001.Michael.Thompson@ACME.cam.itso.ibm.com</ORG_CONTACTINFO>
   <ORG_MGR>1010</ORG_MGR>
</employee>

.....


<employee>
```

```
   <ORG_ID>wpsadmin</ORG_ID>
   <ORG_FIRSTNAME>Admin</ORG_FIRSTNAME>
   <ORG_LASTNAME>Portal&WAS</ORG_LASTNAME>
   <ORG_CONTACTINFO>wpsadmin@ACME.cam.itso.ibm.com</ORG_CONTACTINFO>
   <ORG_MGR>1031</ORG_MGR>
</employee>
```

To return choices lists used in pop-up fields, another basic function is used (Example 6-9).

Example 6-9 Routine that returns choices lists rendered as XML

```
   /**
    *
    * execute a query and return data rendered as xml string suitable for choices
lists(convert all data
    * to string) based o n value / alias pairs
    *
    * @param query
    *           valid sql query - must return 1 or 2 columns (1st column = display label,
2nd column = ID)
    * @param rowElement
    *           tag name for the xml instance to create
    * @param elementName
    *           tag name for the xml instance to create
    * @return xml instance like this
    *    //<rowElement>
    *       <elem value='id1'>val1</elem>
    *       <elem value='id2'>val2</elem>
    *       <elem value='id3'>val3</elem>
    *      //</rowElement>
    *
    */
   public static String getChoicesXML(String query,  String elementName) {

      Statement stmt;
      String resultXML = ""; //$NON-NLS-1$
      ResultSet rs = null;
      p("getChoicesXML: " + query);
      try {
         // connect
         connect();

         // execute query
         stmt = db2con.createStatement(); // Create a Statement object
         rs = stmt.executeQuery(query);
         // get column number (need for row fetch)
         int cols = rs.getMetaData().getColumnCount();
         rs = stmt.executeQuery(query);

         // read data and create xml
         try {
            while (rs.next()) { // Position the cursor
               // add row to return string
               if (cols == 1){
                  //resultXML += createTag(rs.getString(1), elementName, "id=\""+
rs.getString(1) + "\"") + "\n";
                  resultXML += createTag(rs.getString(1), elementName, "") + "\n";
               }else {
                  //resultXML += createTag(rs.getString(1) + "[" + rs.getString(1) + "]",
elementName, "id=\""
```

```
                    //    + rs.getString(1) + "[" + rs.getString(1) + "]" + "\"")
                    //    + "\n";
                    resultXML += createTag(rs.getString(2) + "[" + rs.getString(1) + "]",
elementName, "") + "\n";
                 }
              }
              rs.close(); // Close the ResultSet
              stmt.close();
              //resultXML = createTag("\n" + resultXML, rowElement, ""); //$NON-NLS-1$
           } catch (SQLException e2) {
              // TODO Auto-generated catch block
              e2.printStackTrace();
           }

        } catch (SQLException e) {
           e.printStackTrace();
        } finally {
           // always colde connection
           disconnect();
        }
        p("Results: " + resultXML);
        return resultXML;

     }
```

The returned XML fragments can easily be surrounded with the necessary tags to meet the XForms standard. We can use them for any data instance updates to the XFDL form using the XFDL API routine theForm.encloseInstance for XML instances or theForm.updateXFormsInstance for XForms instances. See the related code in 5.11.2, “Basic servlet methods” on page 325, that describe the servlet methods.

We do not create any data object specific interface classes in this project, since available time and resources do not allow us to do so. This is a good choice in most cases. We miss those dedicated objects only when updating order metadata, but once implemented, the model is not changed.

In a real project, the data model and functionality represented by the DB2ConnectionForms library may be extended in the following way:

- Normalizing data structure (such as separating objects for customer site and customer contact data)
- Defining data object specific classes represented by interface classes exposing getters, setters, and all object-specific data maintenance methods
- Enabling commit/rollback for DB2 transactions
- Providing appropriate data validation and translation methods
- Adding missing insert/update and write methods

After considering the topics above and any possible additional requirements (such as server platform considerations or support for special data types for another project), we can decide to use another driver type than JDBC or to use the driver with other functionality.

The created DB2 interface (class DB2ConnectionForms) exposes the methods in Table 6-4.

Table 6-4 Descriptions of data object methods and parameters

Data object method	Parameters	Description
Employee		
getEmployeeDataXML	emp_id (Employee ID as string) returns String (XML) of emp. data	*Reads* all columns for a selected employee. *Used* for prepopulation with submitter data. *Called* from SubmissionServlet. The function returns an XML fragment with the element names already matched to the required names in the EmployeeDedails xforms instance in the form.
Customer		
Order		
getOrderData	order_id (Employee ID as string) returns String [] array of order data	*Reads* all order data details for a given order ID. *Used*: (method not used). *Called*: (method not used).
getOrderListEmp	emp_id (Employee ID as string) returns String [] array of cust. data	*Reads* all order data details for a given employee (acting as submitter, manager approver, or director approver). *Used* for data display in personalized order table. *Called* in JSP db2listing from servlet inline code.
writeOrderData	orderData (all columns as String[]) returns String [] array of cust. data	*Writes* all order metadata extracted from a submitted form. *Used* to store actual order metadata in a DB2 table. *Called* in SubmissionServlet when receiving a submitted form containing the data instance FormOrderData.
readRowXFDL	order_id (Order ID as string) returns String [] array of cust. data	*Reads* a complete XFDL form as string. *Used* to get XFDL form data on form opening in Stage 2. *Called* in SubmissionServlet on showForm event. Same functionality as getOrderXFDL, but other internal code.
updateRowXFDL	order_id (Order ID as string) returns String [] array of cust. data	*Writes* (insert/update) a complete XFDL form as CLOB. *Used* to store XFDL form data on form submit in stage 2. *Called* in SubmissionServlet on submitForm event.

Data object method	Parameters	Description
writeOrderXFDL	order_id (Order ID as String) returns String [] array of cust. data	*Writes* (insert/update) a complete XFDL form as CLOB. *Used* to store XFDL form data on form submit in stage 2. *Called* in SubmissionServlet on submitForm event. Same functionality as writeRowXFDL, but other internal code.
getNewOrderNumber	returns String containing a new order number	*Increments* the order number in table WPF_ORDNOCNT and returns the new number. *Used*: intended for order number. prepopulation in SubmissionServlet. *Called*: in SubmissionServlet when creating new orders.
Parameters:		
getParamNumValue	par_key (Key as string) returns Number value converted to String	*Reads* a numeric parameter value based on the given key. *Used* to get prepopulation data (business rules) when creating new forms. *Called* in SubmissionServlet on createForm event.
Inventory:		
replaceSubString	String with replaces sub strings	Helper method replacing substrings in a string.
Generic function in DN2Connection:		
getResultsXML	query String containing any valid SQL query instanceTag String defining an XML tag name returns String containing the result rendered as an XML instance	*Reads* any data stored in DB2 defined by the incoming query. *Used*: for data gathering functions in SubmissionSerlet. *Called* from SubmissionServlet
getResultsXML	query String containing any valid SQL query elementName String defining an XML tag name returns String containing the result rendered as an XML instance	*Reads* any data stored in DB2 defined by the incoming query with a limited resultset. *Used*: creates choices lists as XML fragments useful to make data prepopulation easy be replacing internal data instances in the form with the composed XML instance. *Called* from Forms Submission module.

Data object method	Parameters	Description
getChoicesXML	query String containing any valid SQL query	*Reads* any data stored in DB2 defined by the incoming query with a limited resultset. The returned string looks like this: <elem>value1<elem> <elem>value2<elem> .... <elem>valuex<elem> *Used*: Creates choices lists as XML fragments useful to make data prepopulation for choices lists easy be replacing internal data instances in the form with the composed XML instance. *Called* from Forms Submission module.
createTag	tagData data to include tagName name of the tag attributes opt. additional attributes	Creates an XML tag based on an element name, additional attributes, and the contained data. Looks like this: <tagName attributes>tagData</tagName>

Note: All functions accepting an ID (user ID, customer ID, order ID) as an input parameter accept both the ID or a string in the format "<arbitrary text>[<ID>]" as an input parameter value. This is a contribution to the behavior of the drop-down box in Workplace Forms. The DB2 layer is the most efficient place to code the data extraction (single function).

6.3 Form data access using XForms submissions

In this section we discuss various considerations regarding dynamic data access from an opened form using XForms submissions.

There may be the need to retrieve additional data from external data sources while working with the form. There are multiple ways to accomplish this:

- Use the integrated Web service consumer in the Viewer.
- Use XForms submissions.
- Use Custom Function Calls (FCI).

Web service integration in Forms 2.6 Designer has significantly changed since Version 2.5. In this project, we could not get the designed Web services that is included in the Version 2.5 book to run with the Forms Designer V2.6. The reason behind this is that there are limitations that are difficult to overcome with the Forms Designer V2.6. However, the results of the Web service implementation can be reviewed in Appendix C, "Web services" on page 673.

Knowing this, Version 2.6 opens up a new way to process external data access using XForms submissions, and the decision was made to explore these capabilities.

XForms submissions use HTTP messages (GET, POST, or PUT) to transfer XML-compatible data streams in a *request/response* use case. The initiator submits a request to the server and the server sends a response back. The initiator in our case is either the Forms Viewer or the Webform Server that process the opened form. This works regardless of platform, operating system, and programming languages of both the client and the server, because the used transmission protocol and internal data structure of the request and response are defined in a platform-independent standard (HTTP messages/XML). As such, XForms submissions are very similar to SOAP-based Web services with the following differences:

- There is no standardized service description. Provider and consumer are coded independently. The only agreed-upon standard between these instances is the message structure for the passed submissions. Nevertheless, we can set up those instances on both sides (client and server), based on a common schema.
- The data structure transferred in the request/response message can contain arbitrary XML fragments. It is up to the implementation person to make them match his requirements.
- There is no standard error handling.

The good news is that XForms submissions can be handled in the Webform Server as well, which is in contrast to Web services, which cannot be handled in the Webform Server.

XForms submission integration targets the used form (implementing the appropriate submissions in the form) and some Web development, which creates a server component able to receive and submit HTTP POST messages. The developed modules are more closely related to the data sources than to the Web application that handles the forms processing. That is why the created server code is not included in the Forms application but is available as a separate stand-alone application ready to run on different servers.

XForms supports the ability to submit any portion of the data model to a URL, and to replace a portion of the data model with the return value from that submission. This is similar to a Web services call, in that you can submit data to a server and automatically populate the form with the response. However, with an XForms submission, the message that you send does not need to conform to any particular format, whereas a Web services message must be wrapped with a variety of SOAP tags. This means that an XForms submit can send an arbitrary XML fragment. This allows you to mimic Web services calls so that you can use existing assets but, more importantly, allows you to submit data to any portlet or servlet that expects XML input, regardless of the specific format required.

Some constraints have to be considered before implementing XForms submissions:

- There is no standard encryption for the submitted data available (for example, as SSL). This would be difficult to overcome in form design.
- There is no standard authentication/authorization available; however, by submitting credentials within the submitted data, this can be resolved in the application layer.

Note: These restrictions apply only to the built-in XForms implementation. We can, however, develop XForms submissions and include them as a Java library in a custom IFX extension (written in Java or C). These extensions can be called from XFDL computes as additional function libraries.

6.4 Form development for XForms submissions

In this section we discuss how to create the necessary XForms submission and the activating actions in the form, as well as the development of a J2EE application that serves the created XForms submission on server-side by retrieving the requested data from the DB2 back end.

6.4.1 Where we are in the process of building stage 2 of the base scenario

Figure 6-2 gives an overview of where we are within the key steps involved to build stage 2 of the base scenario. This focuses on adding storage capabilities to DB2, incorporating XForms submissions, modifying the JSPs, and adding an approval workflow.

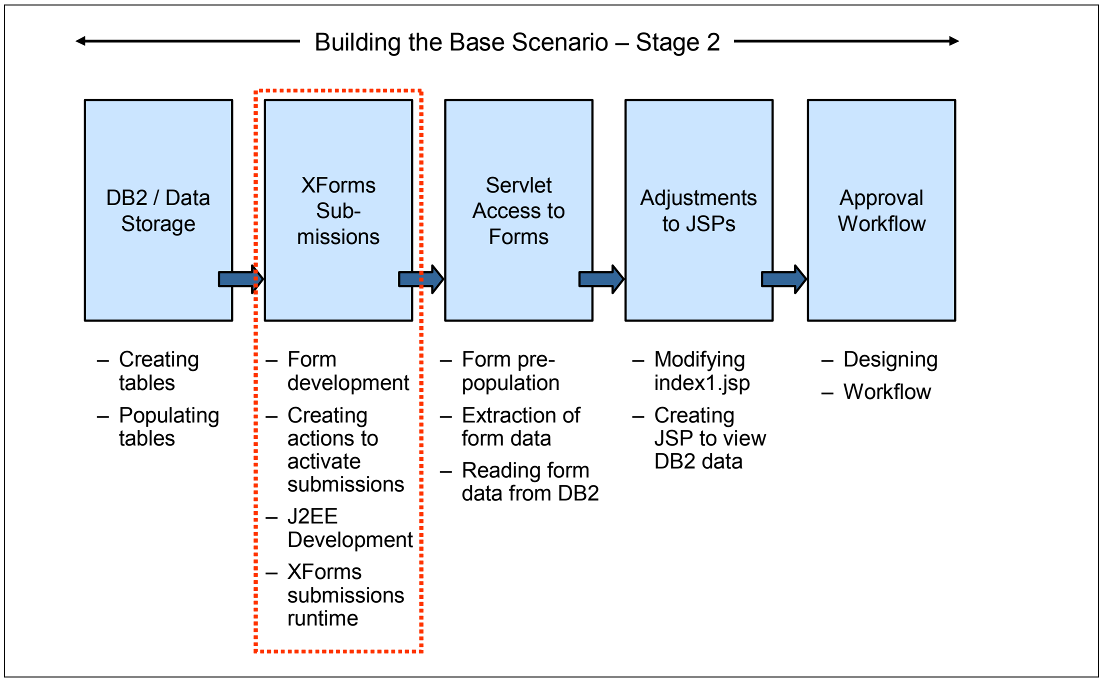


Figure 6-2 Overview of major steps involved in building stage 2 of base scenario application

6.4.2 Development of XForms submissions in the form

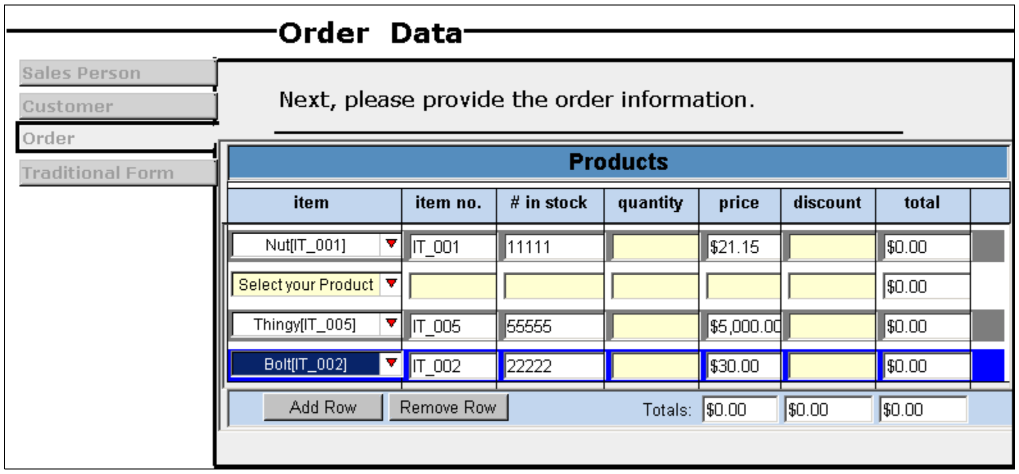
XForms submissions can submit data to external systems, retrieve data form external sources, and copy them to an XForms instance.

The development of an XForms submission in the form is performed in four steps:

1. Detect the data instance (or any inner part of it) containing any parameters to submit in the request.
2. Detect the data instance to update with the response.
3. Create the submission and assign the submission attributes (instance to read, instance to update, transfer method).
4. Create one or more actions that activate the submission.

Identification of data instances

Let us inspect in detail the steps necessary for updating the InventoryItemDetail data instance. This is easily the most complex submission we have in our scenario. The high-level functionality of the component that we need to build is quite straightforward: by clicking one of the item popups in the table shown below and changing the selected item, we expect the component to retrieve the related item data (name, ID, price, and number in stock) from the database and fill the data of the related columns in the selected table row.



item	item no.	# in stock	quantity	price	discount	total
Nut[IT_001]	IT_001	11111		$21.15		$0.00
Select your Product						$0.00
Thingy[IT_005]	IT_005	55555		$5,000.00		$0.00
Bolt[IT_002]	IT_002	22222		$30.00		$0.00
			Totals:	$0.00	$0.00	$0.00

Figure 6-3 Order table with item selection popups

This use case combines two special topics to consider:

- We use a dynamic URL composed from a deployment-dependent part (URL to the application serving the XForms submission) and a submission-dependent part (the URL parameters specifying the exact type of the XForms submission).
- We are not operating end-to-end on static references, but on one of the rows in the order table. This means in detail:
  - We submit additional data to the server (in this case the ID of the item in the selected row).
  - The submission results must update not the entire table, but only the information stored for the selected row.

To compose the submission, we abstract from the table/row problem. The XForms submission operates on static instances for data source and data target. Therefore, in the form, there are two additional instances not bound to any data in the presentation layer. Inspect the instance structure shown in Example 6-10.

Example 6-10 SelectionInfo instance containing the selected item ID

```
<!--Item Selection Info-->
   <xforms:instance id="SelectionInfo" xmlns="">
      <SelectionInfo>
         <InventoryItemID></InventoryItemID>
      </SelectionInfo>
   </xforms:instance>

<!-- Detail data for the Selected Inventory item -->
   <xforms:instance id="InventoryItemDetails" xmlns="">
      <InventoryItemDetails>
         <Item>
          <ID></ID>
          <Name></Name>
          <Price></Price>
          <NumberInStock></NumberInStock>
```

```
            </Item>
        </InventoryItemDetails>
    </xforms:instance>
```

The instance SelectionInfo is supposed to contain the ID of any selected item later on. The instance InventoryItemDetails receives the requested data. To transfer the values from the order table to the SelectionInfo instance and the item data back from InventoryItemDetails instance to the table row, we create dedicated action lists later on. This reduces the complexity of the single objects to create. Let us first build the XForms submission object. The actions to move data and call the submissions are created in the next section.

Submission considerations

We have determined that the settings listed in Table 6-5 should apply in creating any submissions.

Table 6-5 Main submission considerations

Setting	Available choices
Instance (or instance fragment) containing the selection parameter to submit with the XForms submission request	XPATH to an XForms instance or any inner element: instance('SelectionInfo')/InventoryItemID
Data instance to update with the detail data received in the response	Instance ID: We can only update one entire instance, not an inner element only or multiple instances. To do more complex transfers than this, we must store the entire return data in a helper instance and redistribute the data later on, for example, by using actions or binds.
Transfer protocol to use	post, get, or put. The choices to make depend on the submission purpose.
Triggering event	The trigger event is not a part of the submission itself. The submission defines only the scenario for the transfer. To invoke it, we need to create an action. There we can decide about the trigger event.
URL to use for the submission This URL exists in an XForms data instance. It should be updated to the actual available Web application address whenever a form is retrieved from a server.	In the simplest case, we would use a static URL stored in the form. Be aware that there is no single API function to change this value later on. Best practice is to use a dynamic URL stored in an XForms instance. This URL can be updated simply by using the API or a form embedded in an HTML page.

Having considered this, we can start to create the XForms submission.

Creating an XForms submission

To do this:

1. In the Designer, open the XForms view, right-click the model entry containing the target XForms instances (in our case, **Model: Default**), and select the **Create submission** entry, as shown in Figure 6-4.

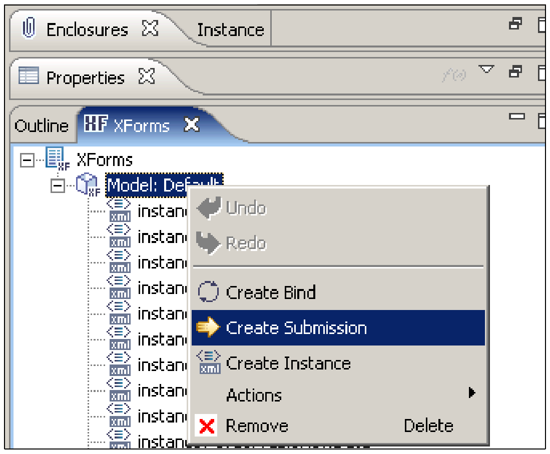


Figure 6-4 Creating an XForms submission in XForms view

2. Expand the **Properties** view for the created submission and assign the attributes shown in Table 6-6. For a detailed explanation of the attributes refer to the XFDL specification 7.0.

Table 6-6 Attribute settings for the XForms submission

Attribute	Setting/explanation
General ID	Value: GetInventoryDetails We can apply here any unique name. We use that unique name to reference the submission in any action, activating it. Enter a self-explanatory name here.

XForms
ref
	Value: instance('SelectionInfo')/InventoryItemID
	
	This attribute contains the reference to the data object with any information we want to submit to the server. We use it to send the item ID for which we request detail data. The XPath reference allows us to submit an entire instance or any parts of it. The created data structure depends on the structure included by the XPath reference. In our case, this would be the ID only.
	You can type the information manually or get it with the Copy Reference method from the instance pane.
	The instance has the following structure:
	`<xforms:instance id="SelectionInfo" xmlns="">`
	`<SelectionInfo>`
	`<InventoryItemID></InventoryItemID>`
	`</SelectionInfo>`
	`</xforms:instance>`

XForms action	Value: http://anyURLItMustBeHereButHasNoEffectDueToActionrefAttribute Here we must enter a static URL. The URL is used if no dynamic URL is provided. We use a dynamic URL stored in the ConfigurationInfo instance. Nevertheless, any URL must be stored here to avoid validation errors. Take the one above or any other URL.

Attribute	Setting/explanation
XForms method	Value: post There are three choices: get (sends data URL-encoded in the URL as parameters) put (sends data similar to a post stream, but does not expect a response) post (sends data in a post stream able to contain huge data size and expects a response to every request. The response can update an XForms submission. This is what we need)
XForms mediatype	Value: text/xml Select from the list. The selection should be set up the request header and match the intended submission behavior.
XForms replace	Value Instance This setting allows us to update a dedicated XForms instance while keeping all other information in the form in place. Selection **all** would replace the entire form with new content (for example, an HTML response page after a final submit of some form data). Selection **none** would ignore any response message data.
XForms instance	Value: InventoryItemDetails Apply here the ID of the instance to replace (this option is valid only if the replace-method is set to *instance*). We use this instance to store the retrieved data. The action(list) calling the submission must make sure to set the correct item ID in the path instance('SelectionInfo')/InventoryItemID and copy the required data in the selected table row before the submission is called and after the submission response is arrived.
XForms actionref	Value: concat(instance('ConfigurationInfo')/XFormsSubmissionURL, 'action=getDetails&instanceID=InventoryItemDetails') This is the most complex part of the submission. The attribute is optional and allows overwriting the static submission URL stored in the action attribute with a dynamic URL computed at runtime. Here we can identify the following components: **i**nstance('ConfigurationInfo')/XFormsSubmissionURL - the path to the XForms element storing the submission URL - in our case the address of the XForms submission servlet including a question mark (for example, http://vmforms261.cam.itso.ibm.com:10000/WPForms261RedbookXForms/XFormsSubmissionServlet?). action=getDetails&instanceID=InventoryItemDetails - the URL parameters defining the type of data we request (here the inventory item details). These parameters vary for each submission in our form. concat(..., ...) - the XPath function to concatenate two strings. The result in our case will be the complete submission URL including the request URL parameters like this: `http://vmforms261.cam.itso.ibm.com:10000/WPForms261RedbookXForms/XFormsSubmissionServlet?action=getDetails&instanceID=InventoryItemDetails`

3. Once these settings are applied, save the form.

In a similar manner, create the other three submissions. The resulting source code is shown in Example 6-11.

Example 6-11 Created XFDL code based on the four submissions in the form

```
<xforms:submission
   action="http://anyURLItMustBeHereButHasNoEffectDueToActionrefAttribute"
   id="GetInventoryDetails"
   instance="InventoryItemDetails" mediatype="text/xml" method="post"
   ref="instance('SelectionInfo')/InventoryItemID" replace="instance"
   xfdl:actionref="concat(instance('ConfigurationInfo')/XFormsSubmissionURL,
      'action=getDetails&amp;instanceID=InventoryItemDetails')">
</xforms:submission>
<xforms:submission
   action="http://anyURLItMustBeHereButHasNoEffectDueToActionrefAttribute"
   id="GetCustomerChoices"
   instance="CustomerIDs" mediatype="text/xml" method="post" replace="instance"
   xfdl:actionref="concat(instance('ConfigurationInfo')/XFormsSubmissionURL,
      'action=getChoices&amp;instanceID=CustomerIDs')">
</xforms:submission>
<xforms:submission
   action="http://anyURLItMustBeHereButHasNoEffectDueToActionrefAttribute"
   id="GetCustomerDetails"
   instance="CustomerDetails" mediatype="text/xml"method="post"
   ref="instance('FormOrderData')/CustomerID" replace="instance"
   xfdl:actionref="concat(instance('ConfigurationInfo')/XFormsSubmissionURL,
   'action=getDetails&amp;instanceID=CustomerDetails')">
   </xforms:submission>
<xforms:submission
   action="http://anyURLItMustBeHereButHasNoEffectDueToActionrefAttribute"
   id="GetInventoryChoices"
   instance="InventoryItems"
   mediatype="text/xml" method="post" ref="" replace="instance"
   xfdl:actionref="concat(instance('ConfigurationInfo')/XFormsSubmissionURL,
      'action=getChoices&amp;instanceID=InventoryItems')">
</xforms:submission>
```

Note: The two submissions requesting the choices list have no request attributes. This is valid in our case, because we are trying to extract the entire choices list. In a production environment, we should submit here some selection criteria as the item category, a search pattern for the product number, or any other information to reduce the length of the returned item list.

Submissions are created. Now let us activate them.

6.4.3 Creating actions to activate the submission

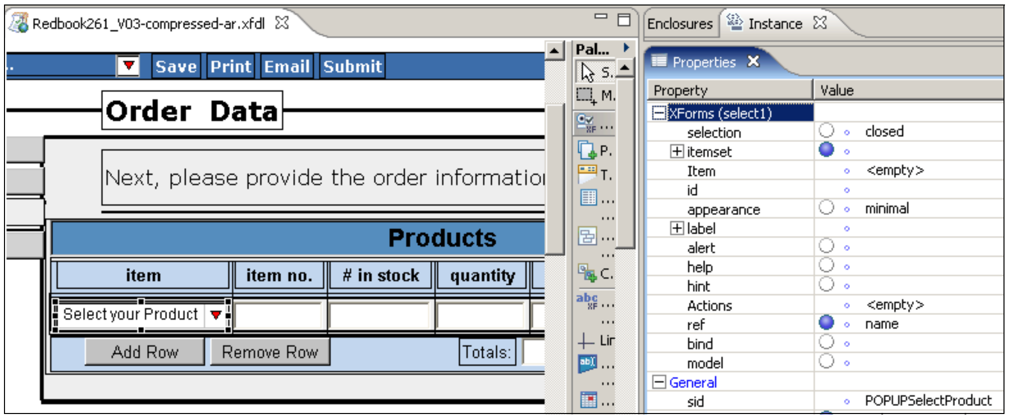
Keep in mind that we are now creating a complex action that ensures the updating of the item detail information in one table row based on the item selected in first column of the table. In the XForms specification, there are many events that can trigger an XForms action. For the detail data request, we decide to use an action applied to a field and activated on value change. This produces the desired behavior for the planned operation:

- Data retrieval only occurs on value change (which produces the best performance).

- Operating from a field in the presentation layer, we can determine the currently selected table row.

The following steps illustrate how the XForms actions are composed to activate the submissions.

1. Open the form in Designer and select the popup field in the order table. Expand the properties (XForms section) for this item, as shown in Figure 6-5.



Property	Value
XForms (select1)	
selection	closed
itemset	
Item	<empty>
id	
appearance	minimal
label	
alert	
help	
hint	
Actions	<empty>
ref	name
bind	
model	
General	
sid	POPUPSelectProduct

Figure 6-5 Item popup field in the Wizard_order_info page with empty action parameter

2. In the Properties view, we find an empty action parameter that we are now going to fill in. In the simplest case (acting on fixed data instances and field in the UI), we could add one single action to activate. In our case, we must surround that action with additional functionality to move the selection data from the table row to the selection instance and transfer the response data back to the appropriate row in the table. Since all data visible in the table is stored in an XForms instance, we have to deal with four objects for this transaction.

The following instances store the entire table data:

- The OrderTableRowData instance stores the entire table data in multiple rows. (This is done in stage 1.)
- The SelectionInfo instance contains the selected item ID. (We will have to make this true.)
- The InventoryItemDetails instance receives the response with the table detail data. (We must code for this, too.)
- The repeat with the ID ORDERWIZARDTABLE contained in the table where we are operating in allows us to detect the current table row index.

Ensure that the instance structure and the structure for the table conform with each other before starting any coding tasks. The data instances are shown in Example 6-12.

Example 6-12 Data instances involved in inventory item detail data update

```
<!--Item Selection Info-->
   <xforms:instance id="SelectionInfo" xmlns="">
      <SelectionInfo>
         <InventoryItemID></InventoryItemID>
      </SelectionInfo>
   </xforms:instance>
```

....

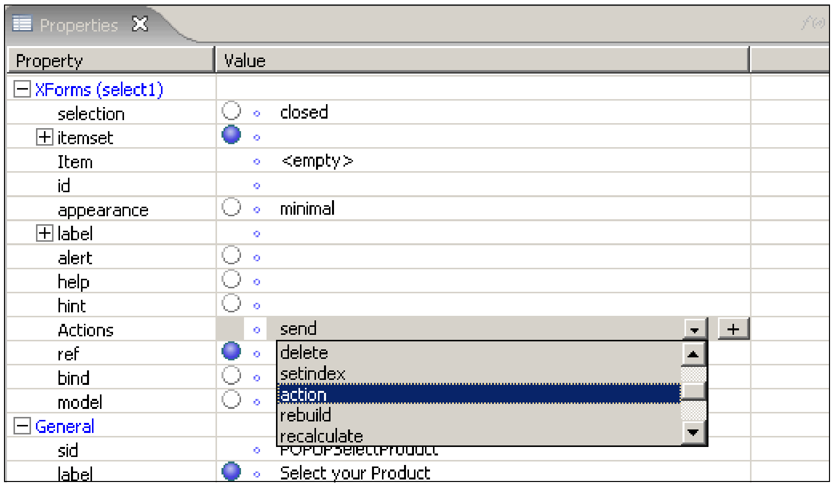
```
           <!-- Detail data for the Selected Inventory item -->
              <xforms:instance id="InventoryItemDetails" xmlns="">
                 <InventoryItemDetails>
                    <Item>
                     <ID></ID>
                     <Name></Name>
                     <Price></Price>
                     <NumberInStock></NumberInStock>
                    </Item>
                 </InventoryItemDetails>
              </xforms:instance>

.........

<!-- Row Data for the Selected Item -->
             <xforms:instance id="OrderTableRowData" xmlns="">
                 <OrderTableRowData>
                    <Row>
                       <line>
                          <id></id>
                          <name></name>
                          <price></price>
                          <stock></stock>
                          <amount></amount>
                          <discount></discount>
                          <line_total></line_total>
                          <subtotal></subtotal>
                       </line>
                    </Row>
                 </OrderTableRowData>
              </xforms:instance>
```

Example 6-13 Table structure in Wizard_order_info page (truncated)

```
           <table sid="ORDERWIZARDTABLE_TABLE">
              <xforms:repeat id="ORDERWIZARDTABLE"
                nodeset="instance('OrderTableRowData')/Row/line">
                 <pane sid="ROW_GROUP">
                    <xforms:group ref=".">
                       <xforms:label></xforms:label>
                       <popup sid="POPUPSelectProduct">
                          <xforms:select1 ref="name">
                             <xforms:label>POPUP1</xforms:label>
                             <xforms:itemset
nodeset="instance('InventoryItems')/InventoryItem">
                                <xforms:label></xforms:label>
                                <xforms:value></xforms:value>
                             </xforms:itemset>
                             <xforms:action></xforms:action>
                            </xforms:select1>
                            <itemlocation>
                             <width>135</width>
                             <x>1</x>
                          </itemlocation>
                          <value></value>
                          <label>Select your Product</label>
                          <format>
                             <datatype>string</datatype>
                             <constraints>
                                <mandatory>on</mandatory>
                             </constraints>
                          </format>
                          <fontinfo>
                             <fontname>Arial</fontname>
                             <size>7</size>
                          </fontinfo>
                       </popup>
          ......
```

Pay attention to the ID of the repeat in the table, shown in Example 6-13 on page 399. We reference it later on to determine the actual selected row in the table.

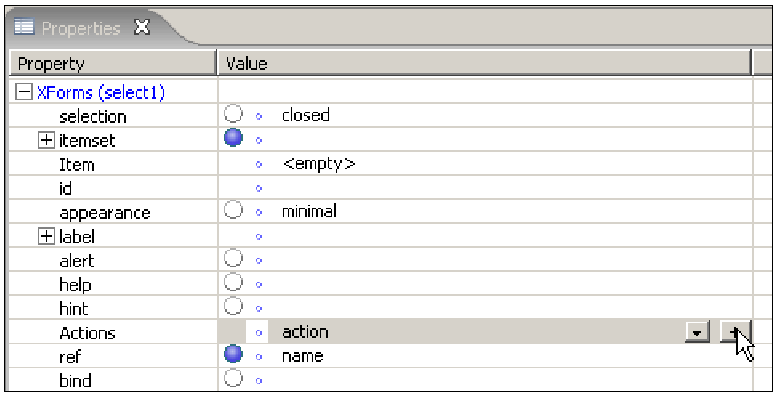
3. Go back to the Properties view in the Designer. We can now start to create the actions.
4. Click one of the available Actions attributes for the pop-up field and select **action** from the choices list (scroll down until you can select the action entry), as shown in Figure 6-6.



Property	Value
⊟ XForms (select1)	
selection	closed
⊞ itemset	
Item	<empty>
id	
appearance	minimal
⊞ label	
alert	
help	
hint	
Actions	send
ref	delete
bind	setindex
model	action
⊟ General	rebuild / recalculate
sid	POPUPSelectProduct
label	Select your Product

Figure 6-6 Applying action element to the Actions attribute

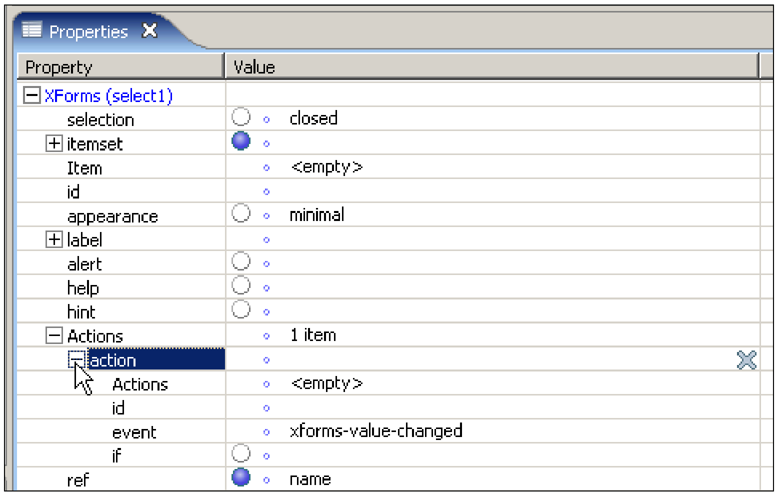
5. Click the plus (**+**) button and expand the created structure, as shown in Figure 6-7. This assignment does not process any specific action, but it allows us to assign multiple actions to the object.



Property	Value
XForms (select1)	
selection	closed
itemset	
Item	<empty>
id	
appearance	minimal
label	
alert	
help	
hint	
Actions	action
ref	name
bind	

Figure 6-7 Adding the action element

6. The default event trigger for this field is **xforms-value-changed**, as shown in Figure 6-8. Select this default value, as this is what we need to use.



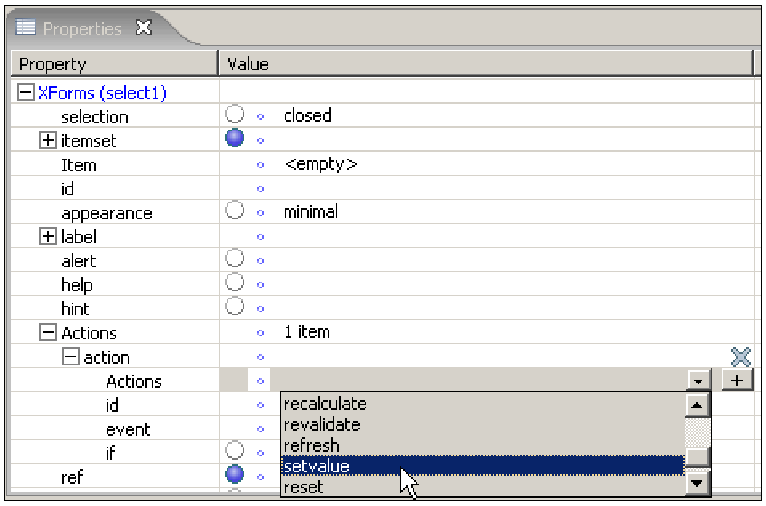
Property	Value
XForms (select1)	
selection	closed
itemset	
Item	<empty>
id	
appearance	minimal
label	
alert	
help	
hint	
Actions	1 item
action	
Actions	<empty>
id	
event	xforms-value-changed
if	
ref	name

Figure 6-8 Expanded structure for the created action element

Action to transfer value of selected field to instance

We can now start to add our *working* actions. They are triggered on the event of the created action element (value changed) and executed in top-down order.

1. Add the first action to transfer the value of the selected pop-up field to the SelectionInfo instance. Add one action of type **setvalue** (similar to the way we add this action to the Actions attribute), click the **+** button and expand the inner structure to apply settings for data source and target, as shown in Figure 6-9.



Property	Value
XForms (select1)	
selection	closed
itemset	
Item	<empty>
id	
appearance	minimal
label	
alert	
help	
hint	
Actions	1 item
action	
Actions	
id	
event	
if	
ref	

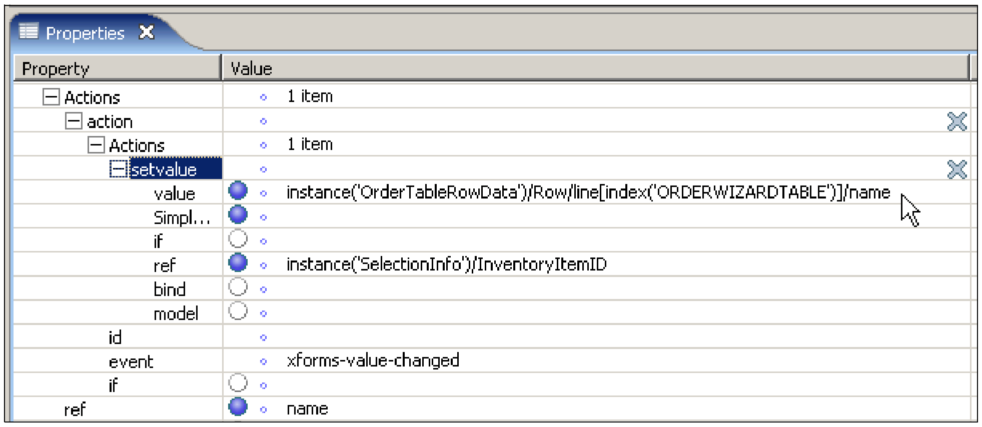
Figure 6-9 Adding a setvalue action

2. We must apply the settings shown in Table 6-7. The Properties view with the applied settings are shown in Figure 6-10 on page 403.

Table 6-7 Properties for setvalue action reading the current item name and ID

Attribute	Setting/explanation
value	Value: instance('OrderTableRowData')/Row/line[index('ORDERWIZARDTABLE')]/name The value attribute contains the reference to the data source. We compose it using the following elements: ▶ instance('OrderTableRowData')/Row/line[rowNumber]/name - XPath reference to a name element in the XForms instance containing the table data. The expression for the row number points to the line element that relates to the currently selected row. ▶ index('ORDERWIZARDTABLE') - This returns the selected row number in the table. Note: ORDERWIZARDTABLE is the ID of the repeat that we created in stage 1. Assigning IDs to repeats is optional, but it becomes mandatory when we try to detect the selected row.

Attribute	Setting/explanation
ref	Value: instance('SelectionInfo')/InventoryItemID This attribute specifies the target to fill with the selected data.



Property	Value
Actions	1 item
action	
Actions	1 item
setvalue	
value	instance('OrderTableRowData')/Row/line[index('ORDERWIZARDTABLE')]/name
Simpl...	
if	
ref	instance('SelectionInfo')/InventoryItemID
bind	
model	
id	
event	xforms-value-changed
if	
ref	name

Figure 6-10 Applied settings to copy the item selection to the SelectionInfo instance

3. The applied settings should result in the following code applied to the pop-up field. Make sure to have all attributes applied as shown in Example 6-14.

Example 6-14 Code created for the first applied action

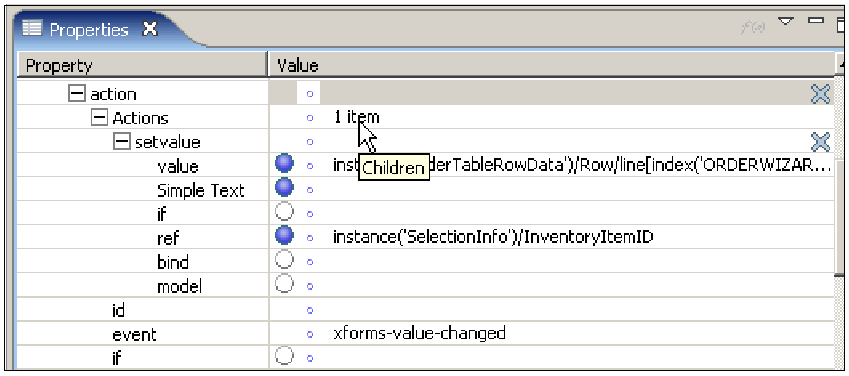
```
   <popup sid="POPUPSelectProduct">
      <xforms:select1 ref="name">
         <xforms:label>POPUP1</xforms:label>
         <xforms:itemset nodeset="instance('InventoryItems')/InventoryItem">
            <xforms:label></xforms:label>
            <xforms:value></xforms:value>
            </xforms:itemset>
            <xforms:action ev:event="xforms-value-changed">
               <xforms:setvalue
                  ref="instance('SelectionInfo')/InventoryItemID"
                  value="instance('OrderTableRowData')/Row/line
                  [index('ORDERWIZARDTABLE')]/name">
               </xforms:setvalue>
            </xforms:action>
         </xforms:select1>
......
```

Action to call the XForms submission

To do this:

1. Now we add the second action. This action calls the created XForms submission. It should submit the value transferred to the instance('SelectionInfo')/InventoryItemID element and store the received data to the InventoryItemDetails instance.

2. Select the action type **send** to activate the submission. Click the entry **1 item** in the upper level action attribute, select **send**, and click the + button, as shown in Figure 6-11.

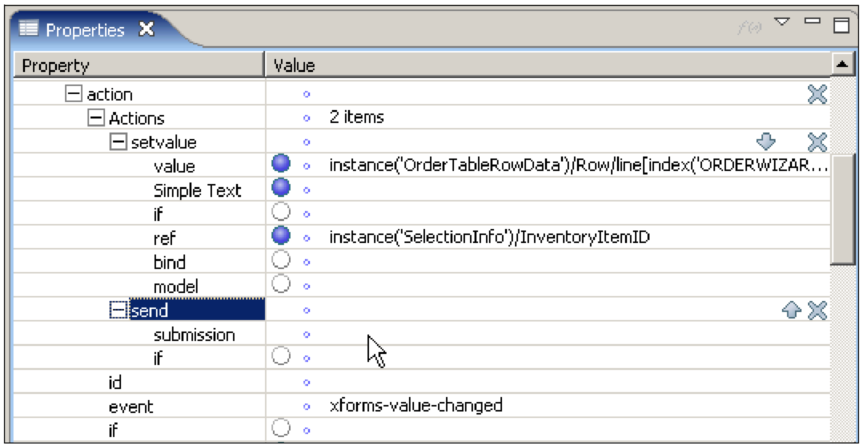


Properties

Property		Value
action		
Actions		1 item
setvalue		
value	●	inst Children derTableRowData')/Row/line[index('ORDERWIZAR…
Simple Text	●	
if	○	
ref	●	instance('SelectionInfo')/InventoryItemID
bind	○	
model	○	
id		
event		xforms-value-changed
if	○	

Figure 6-11 Adding the second action

3. In this action, apply the submission to activate it. Click the submission value field, as shown in Figure 6-12.

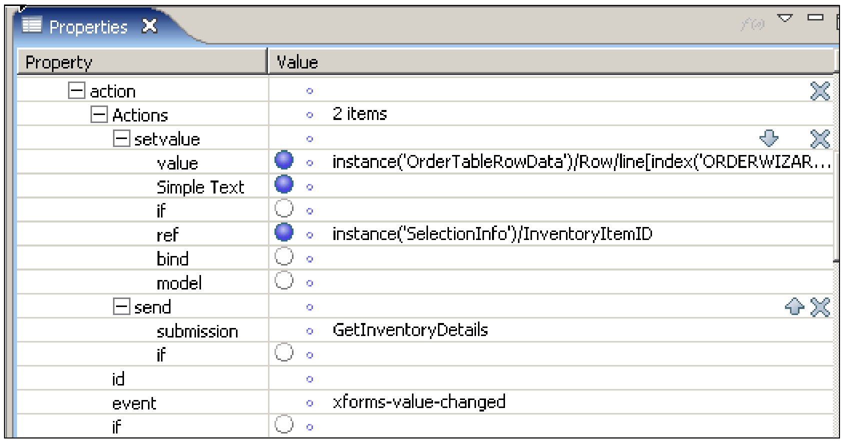


Properties

Property		Value
action		
Actions		2 items
setvalue		
value	●	instance('OrderTableRowData')/Row/line[index('ORDERWIZAR…
Simple Text	●	
if	○	
ref	●	instance('SelectionInfo')/InventoryItemID
bind	○	
model	○	
send		
submission		
if	○	
id		
event		xforms-value-changed
if	○	

Figure 6-12 Select the submission field

4. Select the created submission (**GetInventoryDetails**) from the list. The result is shown in Figure 6-13.



Properties

Property		Value
action		
Actions		2 items
setvalue		
value	●	instance('OrderTableRowData')/Row/line[index('ORDERWIZAR…
Simple Text	●	
if	○	
ref	●	instance('SelectionInfo')/InventoryItemID
bind	○	
model	○	
send		
submission		GetInventoryDetails
if	○	
id		
event		xforms-value-changed
if	○	

Figure 6-13 Assigned submission to activate

This submission submits the value from the SelectionInfo instance to the server and receives the detail data for the assigned item in an XML structure. The server implementation for this submission (we create it in the next section) sends an XML fragment exactly matching the structure of the receiving instance (InventoryItemDetails). The actions to create now have to move the elements from this transfer instance to the elements in the selected table row. The actions are similar to the first created action (type setvalue), but we have changed the data source and target.

5. Add three additional actions to the list and apply the attributes shown in Table 6-8.

Table 6-8 Properties for actions copying the item values to the current row in the order table

Attribute	**Setting/explanation**
first action	Move the item ID to the element related to the ID field in the table row.
value	Value: instance('SelectionInfo')/InventoryItemID The received value for the ID.
ref	Value: instance('OrderTableRowData')/Row/line [index('ORDERWIZARDTABLE')]/name The received value for the ID.
second action	Move the item price for the item to the price field in the table row.
value	Value: instance('InventoryItemDetails')/Item/Price The received value for the price.
ref	Value: instance('OrderTableRowData')/Row/line[inde x('ORDERWIZARDTABLE')]/price Target Path to the price element in the OrderTableRowData instance.
third action	Move the item number in stock for the item to the corresponding field in the table row.
value	Value: instance('InventoryItemDetails')/Item/NumberI nStock The received value for the item number in stock.
ref	Value: instance('OrderTableRowData')/Row/line[inde x('ORDERWIZARDTABLE')]/stock Target path to the stock element in the OrderTableRowData instance.

6. The actions are now complete. Double check the created code, as shown in Example 6-15, in the Source tab.

Example 6-15 Code for created actions

```
<xforms:action ev:event="xforms-value-changed">
   <xforms:setvalue
      ref="instance('SelectionInfo')/InventoryItemID"
      value="instance('OrderTableRowData')/Row/line
         [index('ORDERWIZARDTABLE')]/name">
   </xforms:setvalue>
   <xforms:send submission="GetInventoryDetails"></xforms:send>^
   <xforms:setvalue
      ref="instance('OrderTableRowData')/Row/line
         [index('ORDERWIZARDTABLE')]/price"
      value="instance('InventoryItemDetails')/Item/Price">
   </xforms:setvalue>
   <xforms:setvalue
      ref="instance('OrderTableRowData')/Row/line
         [index('ORDERWIZARDTABLE')]/stock"
      value="instance('InventoryItemDetails')/Item/NumberInStock">
   </xforms:setvalue>
   <xforms:setvalue
      ref="instance('OrderTableRowData')/Row/line
         [index('ORDERWIZARDTABLE')]/id"
      value="instance('InventoryItemDetails')/Item/ID">
   </xforms:setvalue>
</xforms:action>
```

Order table

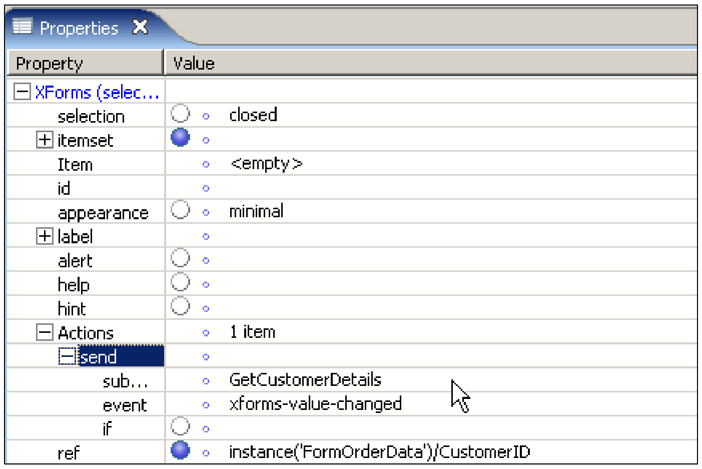
Since the order table is available on the summary page as well, we have to create a similar structure for this table. The most efficient way to do it is to follow these steps:

1. Open the form (with the popup field selected) in the Source tab. Select the created XFDL code for all actions (as shown in Example 6-15) and copy it to the corresponding place in the TABLEORDERDETAILS2.
2. Change the repeat ID in the copied XML fragment from ORDERWIZARDTABLE to TABLEORDERDETAILS2.

Action to get customer detail data

Having the first action list in place, the creation of the other actions is easy. All other actions are single actions, since they can operate on hard-coded XForms references to the data source and target.

The action to get customer detail data should be assigned to the appropriate popups for customer selection (available in two places). In each popup create a send action, as shown in Figure 6-14.



Property	Value
⊟ XForms (selec…	
selection	○ closed
⊞ itemset	●
Item	<empty>
id	
appearance	○ minimal
⊞ label	
alert	○
help	○
hint	○
⊟ Actions	1 item
⊟ send	
sub…	GetCustomerDetails
event	xforms-value-changed
if	○
ref	● instance('FormOrderData')/CustomerID

Figure 6-14 Action to get CustomerDetail data (type send, submission GetCustomerDetails)

Actions to retrieve choices lists

The last two actions must retrieve the choices lists. We assign the actions to the data model to ensure that the choices lists are in place on form open. The data model provides a different event list. Here we can find events that are triggered on page load, on page destruction, and on error occurrence. Here we must make sure that the actions fire only when the form is opened in Viewer or Webform Server, but not when opening with the API. The API would cause an error because it cannot run submissions. To meet these requirements, we have two corresponding settings:

- Fire the submissions in the xforms-model-construct-done event (that is, just after the node tree construction is completed but before the user has access to the form).
- Open the form with the API with flags that have set the XFDL.UFL_XFORMS_INITIALIZE_ONLY flag as discussed in 5.11.7, “Extraction of form data” on page 339. This ensures that the node structure is built (as needed for signature evaluation and some other features), but then the XForms engine is deactivated, so the actions running in xforms-model-construct-done or later do not execute.

Now we show how to create them.

1. Open the XForms pane in Designer, expand the XForms element, and right-click the Default model. Select **Action** → **Create send** from the right-click menu, as shown in Figure 6-15.

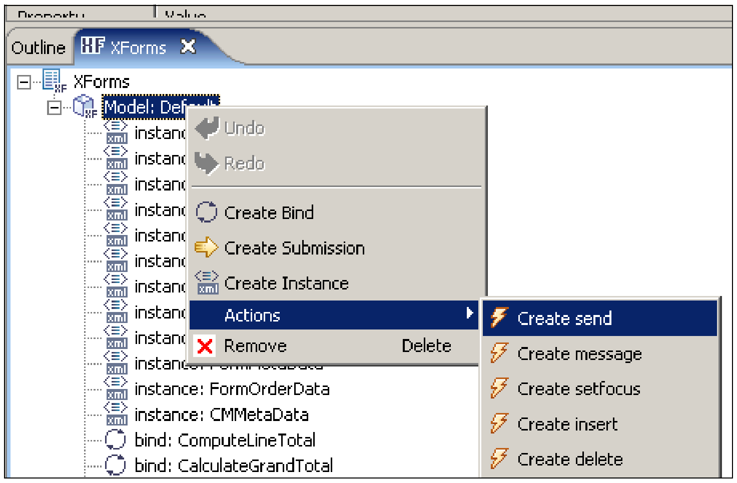
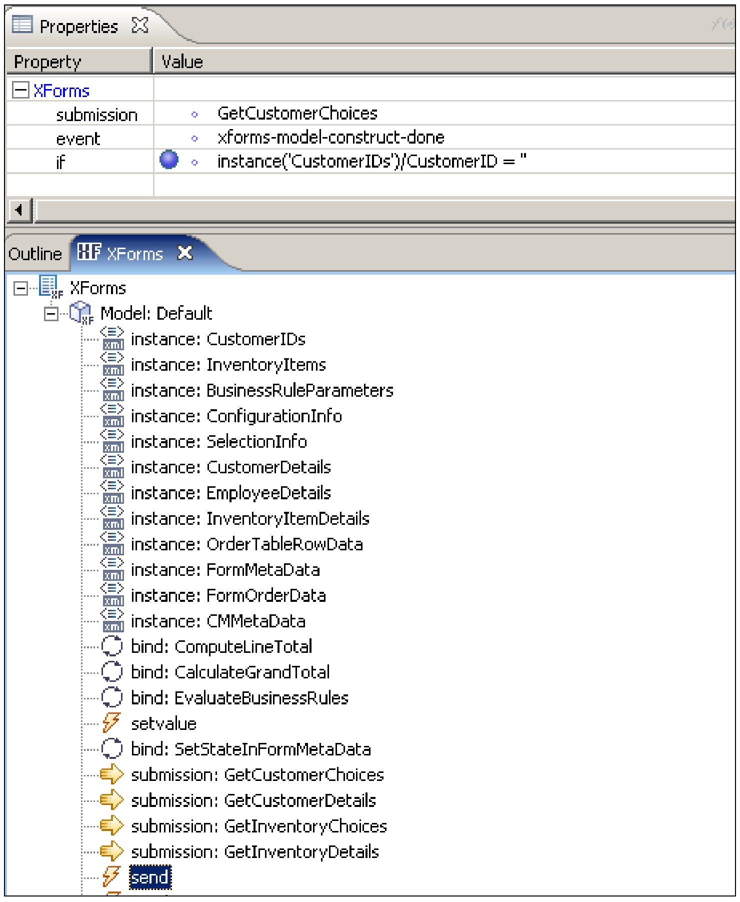


Figure 6-15 Creating an action in the model context

2. This creates a new entry inside the model element list. Expand the list and open the Properties view for the new send action, as shown in Figure 6-16.



Property	Value
XForms	
submission	GetCustomerChoices
event	xforms-model-construct-done
if	instance('CustomerIDs')/CustomerID = ''

Properties
Outline
XForms
XForms
Model: Default
instance: CustomerIDs
instance: InventoryItems
instance: BusinessRuleParameters
instance: ConfigurationInfo
instance: SelectionInfo
instance: CustomerDetails
instance: EmployeeDetails
instance: InventoryItemDetails
instance: OrderTableRowData
instance: FormMetaData
instance: FormOrderData
instance: CMMetaData
bind: ComputeLineTotal
bind: CalculateGrandTotal
bind: EvaluateBusinessRules
setvalue
bind: SetStateInFormMetaData
submission: GetCustomerChoices
submission: GetCustomerDetails
submission: GetInventoryChoices
submission: GetInventoryDetails
send

Figure 6-16 Activating the GetCustomerChoices submission on form load

3. Assign the attributes listed in Table 6-9.

Table 6-9 XForms action triggering the prepopulation for customer choices lists

Attribute	Setting/explanation
submission	Value: GetCustomerChoices Select this submission from the list.
event	Value: xforms-model-construct-done There are two events on page load: ▶ xforms-model-construct - fired when the engine starts to build the node structure for the first time after page load in the Viewer/webform Server/ Forms API ▶ xforms-model-construct-done - fired after the node structure is complete built, but before the user can access the page using the UI.
if	Value: instance('CustomerIDs')/CustomerID = '' This makes sure that the list is loaded only in a new template (just when the choices list is empty). In the real world, there can be different requirements of when to load the choices list. Be aware that reloading the choices list can result in removing the current selection from the list.

Action to load item choices

Last but not least, create the action to load the item choices.

Apply the settings in Table 6-10.

Table 6-10 XForms action triggering the prepopulation for inventory item choices lists

Attribute	Setting/explanation
submission	Value: GetInventoryChoices Select this submission from the list.
event	Value: xforms-model-construct-done
if	Value: instance('InventoryItems')/InventoryItem = '' This makes sure that the list is loaded only in a new template (just when the choices list is empty).

Tip: We can invoke the created submission very easily for multiple controls. For instance, we can add a refresh button performing the appropriate action on the form to load the choices lists manually on demand.

This is the last part to make the XForms submissions run in the form. Save the form and prepare for the J2EE coding in RAD/Eclipse.

6.4.4 Discussion of advanced aspects of using XForms submissions

XForms submissions — similar to Web services — are useful for real-time form population. Instead of the form being submitted to the server, the server filling in the form data, then returning the form, XForms submission can be called using the XForms actions with the type *send*. Having no external definition about the available operations and data structure definitions, as we have in the case of Web services with the WSDL document, it is up to the developer to make sure that the server and the client side are dealing with the same operation model and message structures. This is the point of discussion in this section.

In a production environment, problems typically arise when XForms submissions in multiple (versioned) forms are used extensively. These can be resolved by following these suggestions:

- Versioning of XForms submissions would make the application and form administration significantly easier. This can easily be done by passing with the submission in the URL a version number. The serving application can then differentiate between submission invocations expecting slightly different message structures for the same basic function (for example, detail data extraction for a customer ID).
- Running huge amounts of data-gathering submissions, it can be a good idea not to hard code the submission behavior (running hundreds of XForms submission serving applications after some months of development). The approach could be to write a generic XForms submission solution reading the configuration data for the incoming requests from a database or any other data store. There is no way to include all potential submissions in such a framework, but there is a good chance of serving a majority of the submissions with a generic solution.
- There is another good aspect of storing information about the available submission services and their message structure in a data source: This repository could serve as a submission library exposing purpose, message structure, and other data of the available submissions to your enterprise environment.

The data structures (XForms instances with or without a leading schema), the submissions, and the actions initiating the submissions are defined in the XForms namespace. That way they can be recognized by any external XForms-compatible applications, for example, running on a mobile device.

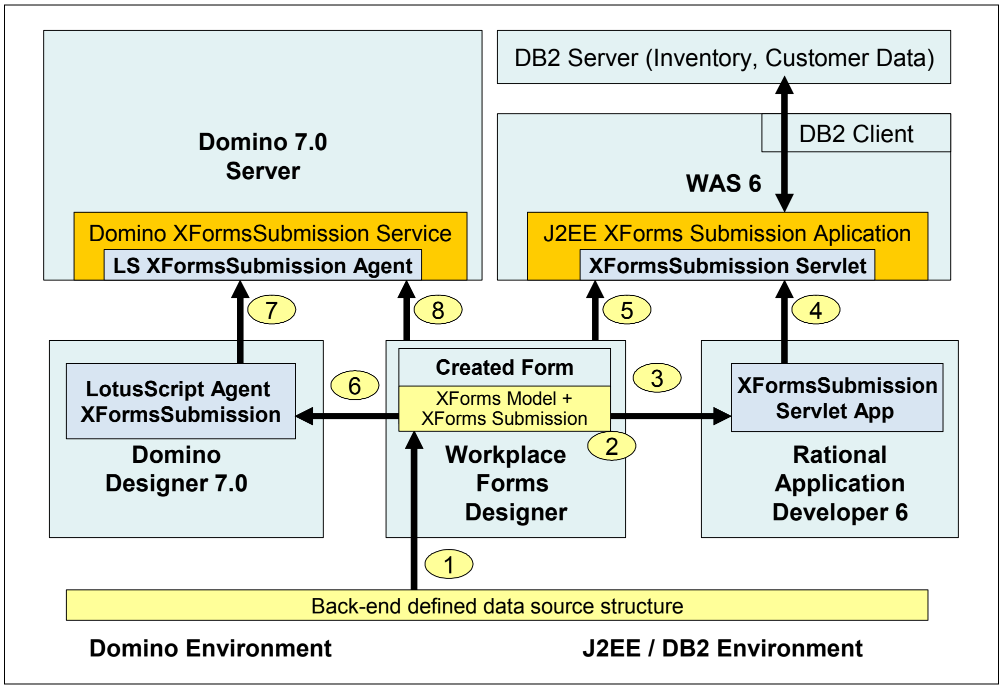
6.4.5 J2EE development for XForms submissions

Finally, we create a special Web application providing the server side for the XForms submissions used in our application. The application consists of a single servlet using the provided DB2Connection module (available as jar file on the server).

The application should match the following specifications:

- Acceptance of HTTP POST messages
- Method detection exploring URL parameters (action and instance ID)

Figure 6-17 illustrates the environment where we plan to implement the XForms submission service for both the J2EE/DB2 environment and the Domino environment.



Domino 7.0 Server
Domino XFormsSubmission Service
LS XFormsSubmission Agent
DB2 Server (Inventory, Customer Data)
DB2 Client
WAS 6
J2EE XForms Submission Aplication
XFormsSubmission Servlet
7
8
5
4
LotusScript Agent XFormsSubmission
Domino Designer 7.0
6
Created Form
XForms Model + XForms Submission
Workplace Forms Designer
3
2
XFormsSubmission Servlet App
Rational Application Developer 6
1
Back-end defined data source structure
Domino Environment
J2EE / DB2 Environment

Figure 6-17 Architecture of XForms submission design (development road map)

We can see in the diagram the following development sequence:

1. We start with the form design, in particular, the definition of the XForms Model containing the data instances (based on the data structure in the external data sources).
2. The next step is the creation of the XForms submission in the form.
3. Based on the defined message structure for request and response (URL parameters + POST data structure), we create the server components (servlet) that are bound to the existing external data sources.
4. The created Web application is deployed to the server.
5. In the Designer Preview tab, we can test the submission by applying the target URLs for the deployed Web application.
6. On the same message structure used in step 3, we create a Domino-based solution for the XForms submission service (in the book, this is a LotusScript agent, but it could be a Java agent or a servlet as well).
7. The created LotusScript agent is deployed to the Domino server.
8. In the Designer Preview tab, we can test the created XForms submission service by applying the target URL for the Domino agent.

Let us focus for now on the J2EE development. We aim to build a server component dealing with the following elements:

- As shown in Example 6-16, the component must be able to detect URL arguments exploring the request URL.

Example 6-16 XForms submission URL requesting detail data for an inventory item

```
http://vmforms261.cam.itso.ibm.com:10000/WPForms261RedbookXForms/XFormsSubmissi
onServlet?action=getDetails&instanceID=InventoryItemDetails
```

- We require parameter detection exploring the POST data stream, as shown in Example 6-17.

Example 6-17 XForms submission POST data containing an additional selection data (Item ID)

```
<InventoryItemID xmlns="" xmlns:custom="http://www.ibm.com/xmlns/prod/XFDL/Custom"
xmlns:designer="http://www.ibm.com/xmlns/prod/workplace/forms/designer/2.6"
xmlns:ev="http://www.w3.org/2001/xml-events"
xmlns:xfdl="http://www.ibm.com/xmlns/prod/XFDL/7.0"
xmlns:xforms="http://www.w3.org/2002/xforms"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
Nut[IT_001]
</InventoryItemID>
```

- We have to compose a response data structure based on DB2 query resultsets as XML, as shown in Example 6-18.

Example 6-18 Example for SQL query and retrieved data using the method getResultsXML

```
Selection:
Nut[IT_001]

query:
SELECT IT_ID, IT_NAME,IT_PRICE, IT_STOCK from WPF_ITEMS WHERE IT_ID ='IT_001'

Results:
<Item>
<IT_ID>IT_001</IT_ID>
<IT_NAME>Nut</IT_NAME>
<IT_PRICE>21.15</IT_PRICE>
<IT_STOCK>11111</IT_STOCK>
</Item>
```

- Finally, we must submit the response data to the submitter, formatted according to the XForms instance structure, as shown in Example 6-19. The results are to replace the complete inner structure of the instance including the root element.

Example 6-19 XForms submission response delivering the detail data for the requested item

```
<InventoryItemDetails>
   <Item>
      <ID>IT_001</ID>
      <Name>Nut</Name>
      <Price>21.15</Price>
      <NumberInStock>11111</NumberInStock>
   </Item>
```

```
</InventoryItemDetails>
```

For our needs, we need to implement four operation modes, as shown in Table 6-11.

Table 6-11 Implementation of four operation modes

Action parameter	submissionID	Request parameters	Results

getChoices	InventoryItems	none (return all item IDs)	<InventoryItems>
			  <InventoryItem>Nut[IT_001]</InventoryItem>
			  <InventoryItem>Bolt[IT_002]</InventoryItem>
			  <InventoryItem>Widget[IT_003]</InventoryItem>
			  <InventoryItem>Gadget[IT_004]</InventoryItem>
			  <InventoryItem>Thingy[IT_005]</InventoryItem>
			  </InventoryItems>

getChoices	CustomerIDs	none (return all customer IDs)	<CustomerIDs> <CustomerID>OnDemand Corporation[100000] </CustomerID> <CustomerID>Workplace Early Adopter Inc[100001] </CustomerID> <CustomerID>Portal Application Surfacing[100002] </CustomerID> <CustomerID>Workplace Forms Redpapers Inc[100003] </CustomerID> <CustomerID>Mobile Devices Corporation[100005] </CustomerID> </CustomerIDs>
getDetails	InventoryItem Details	<InventoryItemID ... >ID</InventoryItemID>	<InventoryItemDetails> <Item> <ID>IT_001</ID> <Name>Nut</Name> <Price>21.15</Price> <NumberInStock>11111 </NumberInStock> </Item> </InventoryItemDetails>

getDetails	CustomerDetai ls	<ID .... >CustomerID</ID>	<CustomerDetails>
			 <Customer>
			  <ID>123</ID>
			  <Company>CompName</Company>
			  <AccountManagerID>N</AccountManagerID>
			  <Department>Dep</Department>
			  <ContactName>CN</ContactName>
			   <ContactPosition>PC</ContactPosition>
			   <ContactEmail>CE</ContactEmail>
			   <ContactPhone>CP</ContactPhone>
			   <CRMNumber>CR#</CRMNumber>
			 </Customer>
			</CustomerDetails>

The related servlet code is somewhat lengthy but the structure is straightforward. The servlet executes the following steps:

1. Inspect URL parameters and detect the method to execute.
2. Create a query based on the detected operation mode.

3. Transform the resultset data into an XML structure matching the data structure in the XForms instance in the form.
4. Send the complete instance data back to the requestor.

The example code for the servlet is shown in Example 6-20.

Example 6-20 XFormsSubmission servlet skeleton

```
// @annotations-disabled tagSet="web"
package com.ibm.form.redbook2.xFormsSubmissionServlet;

import java.io.IOException;
import java.io.InputStream;
import java.io.PrintWriter;

import javax.servlet.ServletException;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;


import forms.cam.itso.ibm.com.*;

/**
 * Servlet implementation class for Servlet: XFormsSubmissionServlet
*/
public class XFormsSubmissionServlet extends javax.servlet.http.HttpServlet
implements javax.servlet.Servlet {

   public XFormsSubmissionServlet() {
      super();
   }
   public void init() throws ServletException {
      // TODO Auto-generated method stub
      super.init();
   }

   protected void doGet(HttpServletRequest request,
      HttpServletResponse response) throws ServletException, IOException {
      // we go not accept get requests - send back an error page.

      response.setContentType("text/html; charset=UTF-8");
      String html = "<HTML><BODY><H1>XFormsSubmissionServlet</H1><BR>";
      html += "please use post only for this url";
      html += "</BODY></HTML>";
      PrintWriter output = response.getWriter();
      output.write(html);
      output.flush();
   }

   protected void doPost(HttpServletRequest request,
      HttpServletResponse response) throws ServletException, IOException {
      String nl = "";

      // set some default values for the case, the request does not
      //contain these parameters
      String query = "SELECT ....";
      String xmlRowTag = "row";
      String xmlElementTag = "cell";
      String res = "";
      String responseMessage = "";
      String selection = "";

      String action = request.getParameter("action");
      if (action == null)  action="<no action specified>";
      // we accept 2 actions at this time: getChoices and getDetails

      String instanceID = request.getParameter("instanceID");
      if (instanceID == null)  instanceID="<no instanceID specified>";
      //we accept only names instance IDs (see the code below)

      //the combination of action and instanceID parameter will decide
      //about the DB2 query to exeute and the response message structure.

      //get the request data to xFormsXML variable -
      //it can contain an additional parameter
      InputStream in = request.getInputStream();
      byte[] b = new byte[in.available()];
      in.read(b);
      String xFormsXML = new String(b);

      if (action.equalsIgnoreCase("getChoices"))
      {  //here we have to send back a data instance filled with data selected
         //based on the target instance.
         //read the corresponding choices from the database
         //and compose the ersponse structure
         //*****************************************************
         // Method dependent code removed here - details see below
         //*****************************************************
         }
      else if (action.equalsIgnoreCase("getDetails")){
         //extract the selection parameter from the received XML
         //in these queries we will extract one additional selection parameter
         // (ID) from the POST data
         //*****************************************************
         // Method dependent code removed here - details see below
         //*****************************************************
         }
      }
      else
      {
         p("no valid parameters: " + request.getQueryString());
         throw new ServletException(
      "Please use the parameter ?action=getChoices or ?action=getDetails");
      }

      //complete the responseMessage to a data instance attaching root element
      //make here the right choice regarding the node structure in the form.
      //both purposes below are valid:
      String xFormsInstance = "<" + instanceID + ">" + responseMessage
         + "</" + instanceID + ">";
      //String xFormsInstance = "<data>"  + responseMessage + "</data>";
```

```
      //return the choices list as HTTP POST
      response.setContentType("text/xml; charset=UTF-8");
      PrintWriter output = response.getWriter();
      output.write(xFormsInstance);
      output.flush();
      output.close();
   }
}
```

In the code shown in Example 6-20 on page 414, the detailed fragments to handle the different data objects are removed. Inspect them in Example 6-21 and Figure 6-22.

Example 6-21 Code snippet that creates the response for choices lists

```
      .....
      if (action.equalsIgnoreCase("getChoices"))
      {  //here we have to send back a data instance filled with data selected
         //based on the target instance. Actually we will not inspeck the POST
data
         //for additional selection parameters, but in real life this should be
done
         //e.g. setting maximum response elements or a filter kriterium to the
query.

         //read the corresponding choices from the database
         //**** put the right values here
         if (instanceID.equals("CustomerIDs")){
            //returns a list of all customers
            query = "SELECT CUST_ID,CUST_NAME from WPF_CUST";
            xmlRowTag = "";
            xmlElementTag = "CustomerID";
         } else if (instanceID.equals("InventoryItems")){
            //returns a list of all items
            query = "SELECT IT_ID,IT_NAME from WPF_ITEMS";
            xmlRowTag = "";
            xmlElementTag = "InventoryItem";
         } else if (instanceID.equals("anyotherinstanceID")){
            //this is a dummy entry for demo purpose
            query = "SELECT * from TABLE_NAME";
            xmlRowTag = "row";
            xmlElementTag = "cell";
         }
         //execute the query and get the XML structure back
         responseMessage = DB2Connection.getChoicesXML(query, xmlElementTag);

         //message in responseMessage is now ready to attach the root elemen
         //and send back
         }
.....
```

Example 6-22 Code snippet that creates the response for detail data requests

```
      ....
      else if (action.equalsIgnoreCase("getDetails")){
         //extract the selection parameter from the received XML
```

```
//in these queries we will extract one additional selection
//parameter (ID)
//from the POST data
if (instanceID.equals("CustomerDetails")){
   //returns the detail data for one customer identified by ID
   //the POST data contains one element like
   //   <ID .......>12345</ID>
   //  or
   //   <ID ......>CustomerName [12345]</ID>
   selection = extractData(xFormsXML); //return the ID or Name[ID] string
   if (selection.indexOf("]") > 0) // extracts the ID from
                                   //Name[ID] string
      selection = selection.substring(selection.indexOf("[")+1,
            selection.length() - 1);

   //compose the query
   query = "SELECT CUST_ID,CUST_NAME,CUST_CONTACT_NAME,” +
   “CUST_CONTACT_EMAIL from WPF_CUST WHERE CUST_ID='" + selection + "'";
   xmlRowTag = "Customer";
   res = DB2Connection.getResultsXML(query, xmlRowTag, 1);
   //res contains a String like
   //<Customer><CUST_ID>111</CUST_ID> .... </Customer>
   //we must replace the Column Names from the DB2 database with
   //the element names required by
   //the XForms instance
   res = DB2ConnectionForms.replaceSubString(res, "CUST_ID>","ID>");
   res = DB2ConnectionForms.replaceSubString(res, "CUST_NAME>","Name>");
   res = DB2ConnectionForms.replaceSubString(res,
         "CUST_CONTACT_NAME>","ContactName>");
   responseMessage = DB2ConnectionForms.replaceSubString(res,
         "CUST_CONTACT_EMAIL>","ContactEmail>");
   //message in responseMessage is now ready to attach the root
   //elemen and send back

} else if (instanceID.equals("InventoryItemDetails")){
   //returns the detail data for one item identified by ID
   //the POST data contains one element like
   //   <ID .......>12345</ID>
   //  or
   //   <ID ......>itemName [12345]</ID>

   selection = extractData(xFormsXML);
   //return the ID or ItemName[ID] string

   if (selection.indexOf("]") > 0)
      // extracts the ID from ItemName[ID] string
      selection = selection.substring(selection.indexOf("[")+1,
            selection.length() - 1);

   //compose the query
   query = "SELECT IT_ID, IT_NAME,IT_PRICE, IT_STOCK from “ +
   “WPF_ITEMS WHERE IT_ID ='" + selection + "'";
   xmlRowTag = "Item";
   //res contains a String like <Item><IT_ID>111</IT_ID> .... </Item>
   //we must replace the Column Names from the DB2 database with
```

```
            //the element names required by
            //the XForms instance
            res = DB2Connection.getResultsXML(query, xmlRowTag, 1);
            res = DB2ConnectionForms.replaceSubString(res, "IT_ID>","ID>");
            res = DB2ConnectionForms.replaceSubString(res, "IT_NAME>","Name>");
            res = DB2ConnectionForms.replaceSubString(res, "IT_PRICE>","Price>");
            responseMessage = DB2ConnectionForms.replaceSubString(res,
               "IT_STOCK>","NumberInStock>");
            //message in responseMessage is now ready to attach the root
            //elemen and send back

         } else if (instanceID.equals("anyotherinstanceID")){
            //dummy case here
            query = "SELECT * from TABLENAME";
            xmlRowTag = "row";
            res = DB2Connection.getResultsXML(query, xmlRowTag, 1);
            res = DB2ConnectionForms.replaceSubString(res, "COL1>","att1>");
            res = DB2ConnectionForms.replaceSubString(res, "COL2>","att2>");
            res = DB2ConnectionForms.replaceSubString(res, "COL3>","att3>");
         }
```

The code utilizes a helper function, as shown in Example 6-23, to extract the request parameter from the submitted XML.

Example 6-23 Extracting the contained data for an XML element

```
/**
    *
    * helper method to extract the data from a single xml element
    * like this: <element ..... >data</element>
    *
    * @param xmlData
    *            complete xml string (single element)
    *
    * @return String containing the extracted value
    */
   static String extractData(String xmlData) {
      String element = ""; //$NON-NLS-1$

      int p1 = xmlData.indexOf(">");
      if (p1 < 0) return "";
      element = xmlData.substring(p1+1);
      int p2 = element.indexOf("<");
      element = element.substring(0, p2);

      return element;
   }
```

6.4.6 XForms submission runtime

Having created all of the components, we can deploy the components to the different systems and run our first test.

Figure 6-18 shows the data flow during runtime. XForms submissions are called in our sample form directly after the first form load (reading choices lists for customers and products from the repository) and during work in the form (gathering detail data after selecting a product or customer). For each XForms submission, steps 2 to 7 in the following section are processed.

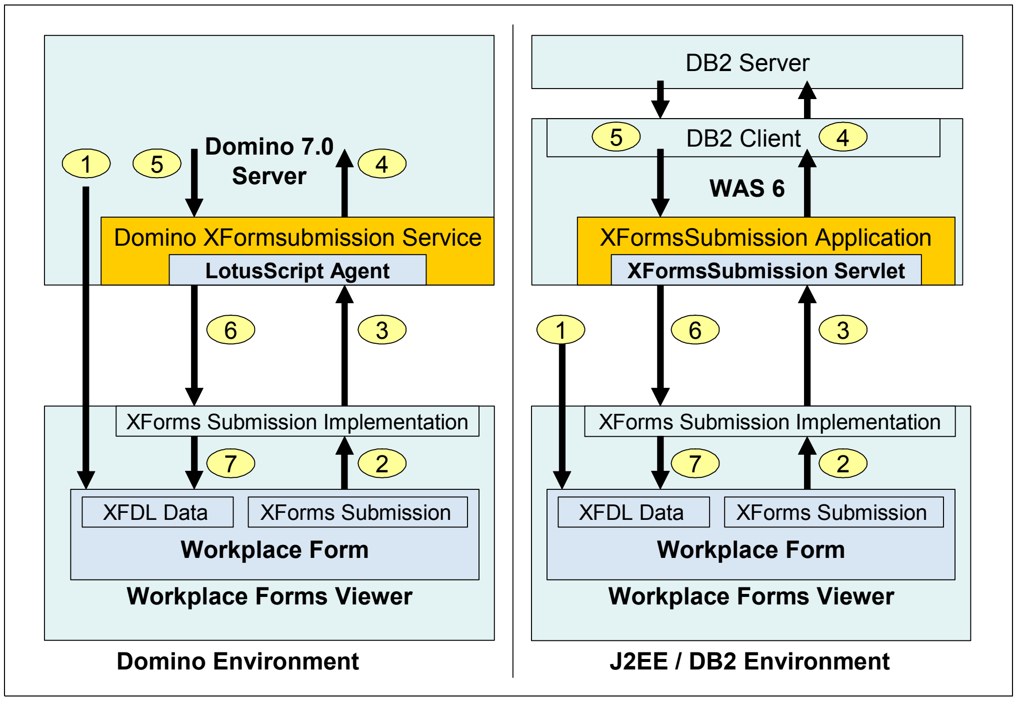


Figure 6-18 XForms submission runtime data flow for Viewer-based scenarios

Figure 6-18 shows the following steps for both the J2EE/DB2 environment and the Domino environment:

1. Form download (with or without value prepopulation initiated on the server side).
2. XForms submission invocation by an XForms action (on first load or any other form events, like a button clicked, or a value change in a field), including transfer on all input parameters for this request.
3. The submission request is created by the XForms submission implementation in the Forms Viewer target URL. The message structure is based on the submitted XForms instance. J2EE or Domino implementation of XForms submission service receives the request and initiates data retrieval.
4. Data query to target source (DB2 or Domino) coded in the J2EE or Lotus Script classes on the server side.
5. Data retrieval from data source (DB2 or Domino) coded in the J2EE or Lotus Script class on the server side.
6. Response message composition on the server side, decomposition in Forms Viewer XForms submission module.
7. Data storage to the target specified in the initiating XForms submission, replacing one entire XForms data instance with the received XML structure.

As a data target to store the response object, XForms submissions can only assign entire XForms instances. The runtime simply replaces the entire node structure of the instance with the received content. This can lead to unexpected side effects, if the received message does not contain the expected XML structure.

For Webform Server environment with Zero Footprint client, XForms submissions work as well. See the data flow in the diagram shown in Figure 6-19.

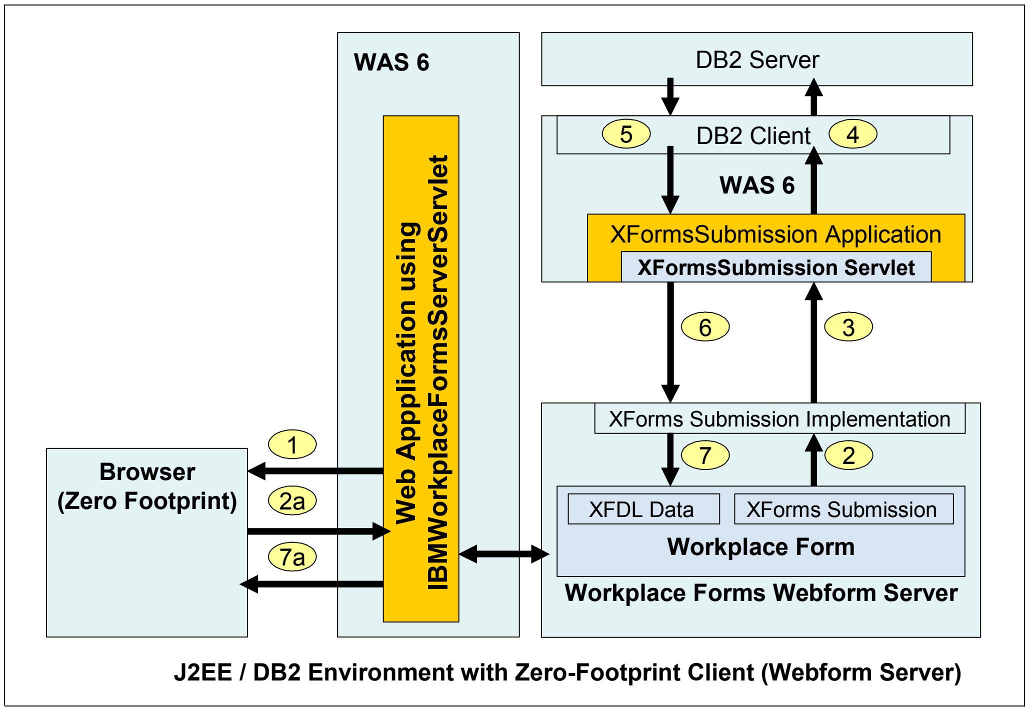

WAS 6
DB2 Server
DB2 Client
5
4
WAS 6
XFormsSubmission Application
XFormsSubmission Servlet
6
3
Web Appplication using IBMWorkplaceFormsServerServlet
XForms Submission Implementation
7
2
1
Browser (Zero Footprint)
2a
7a
XFDL Data
XForms Submission
Workplace Form
Workplace Forms Webform Server
J2EE / DB2 Environment with Zero-Footprint Client (Webform Server)

Figure 6-19 XForms submission data flow in a Zero Footprint environment

We can observe two differences to the Viewer scenario here:

- The client invokes the XForms submission using an Ajax call to the Webform Server (Action 2a on the diagram). It does not send the request to the data source directly.
- Based on the trigger, the Webform Server executes the XForms submission with the assigned URL to the data source (action 3). It evaluates the response according to the submission settings and sends the changed data for the current page back to the client and sends the new data via an Ajax call (action 7a).

All other parts of the data flow are exactly the same as in the Viewer-based J2EE scenario, as shown in Figure 6-18 on page 419.

Important: The Webform Server Version 2.6.1 still does not support Web service calls. This is one of the reasons why we implement the dynamic data gathering in the form using XForm submissions. They are well implemented in the Viewer and in the server component of Workplace Forms.

6.5 Servlet access to form data

In this section we describe how to provide servlet access to the form data. We need this functionality very often for prepopulation and value extraction purpose.

6.5.1 Where we are in the process: building stage 2 of the base scenario

Figure 6-20 is an overview of where we are within the key steps involved to build stage 2 of the base scenario. This focuses on adding storage capabilities to DB2, incorporating Web services, modifying the JSPs, and adding an approval workflow.

As a starting point, we create a copy in the J2EE project from the servlet (SubmissionServlet1) and all JSPs and give them new names (SubmissionServlet, dirlisting.jsp, and similar). We do this so that we can continue to work on the created code structures without destroying the stage 1 application.

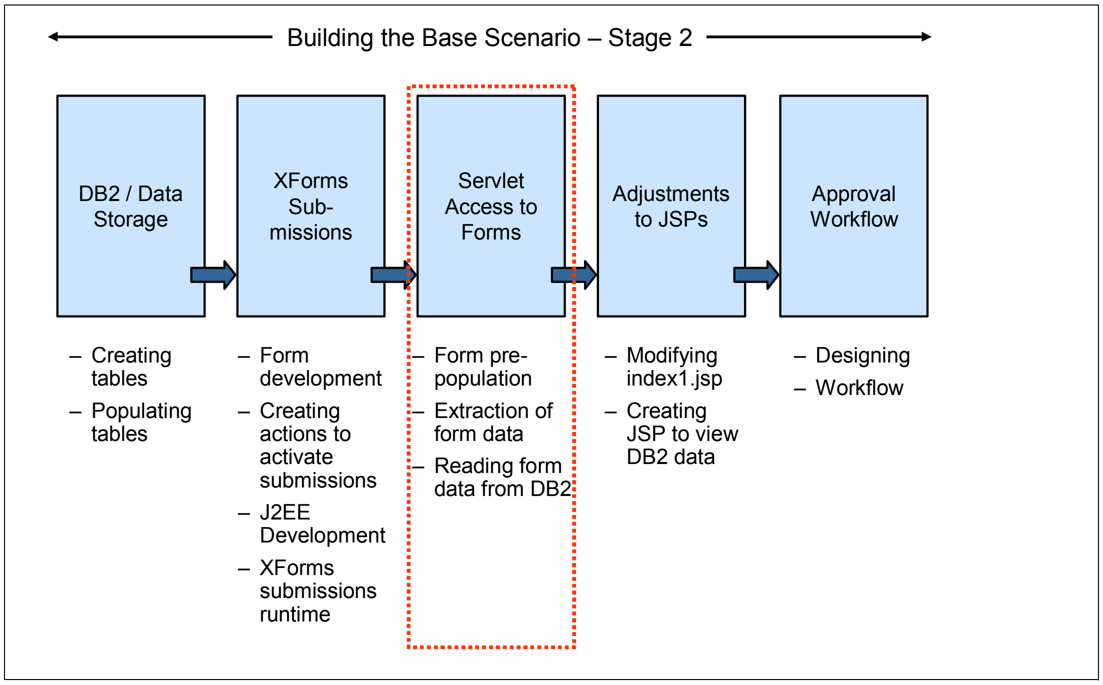


Figure 6-20 Overview of major steps involved in building stage 2 of base scenario application

6.5.2 Servlet access to form data (prepopulation/data retrieval)

While XForms submission is a good choice for runtime data exchange during work in a form opened in the Forms viewer, data prepopulation and retrieval is done on the server side before the form is presented to the end user and after a submitted form is received on the server. Both actions are basically an access to the form available as a file or a stream.

There are two different access methods:

- Access through Workplace Forms API
- Access by text parsing

In this book we provide both techniques. In the servlet context, we use API-based methods only. For Domino integration, we discuss the text parsing methods as well. Both scenarios access the form in the form open event (filling a template with initial data on first open) and data extraction on form submit.

Some developers may prefer to use a third-party XML parser to interface with their forms. Depending on the parser and the types of tasks to be performed, this may provide some benefits in terms of speed or developer comfort (if the developer has a great deal of experience with XML parsers).

However, the API is able to perform some tasks that are impossible for an XML parser. For example, computes can continue to run in the form (or be activated by the API) while the form is in memory, so any form data that is dependent on continuously evaluated computes will remain accurate. Additionally, since most applications use compressed forms, which cut down transmission speeds and use of disk space dramatically, the API is able to automatically decode Base 64 data and uncompresses forms as it reads them. With an XML parser, you must force it to decode and uncompress the forms to run them.

The API also provides methods for verifying and handling digital signatures. Most applications need to verify signatures on the server side, and occasionally even apply signatures on the server. These tasks are virtually impossible to perform without the Workplace Forms API. The API can also encode and decode data items stored such as images, enclosures, and digital signatures. In the case of images and enclosures, this means that using the API it is possible to extract attachments or images from the form and store them separately on the server, or insert attached files into forms as they are sent out to the user.

6.5.3 Form prepopulation

In this stage, we provide server-side prepopulation (Figure 6-21) using the Forms API. Server-side form prepopulation takes place before a user opens a form. The engaged module (such as a servlet) takes control over the initial XFDL form (stored form or empty template as file or stream), accesses the internal values (using API or text parsing), and submits the changed XFDL file/stream to the invoking instance (the viewer or any other module requesting the form).

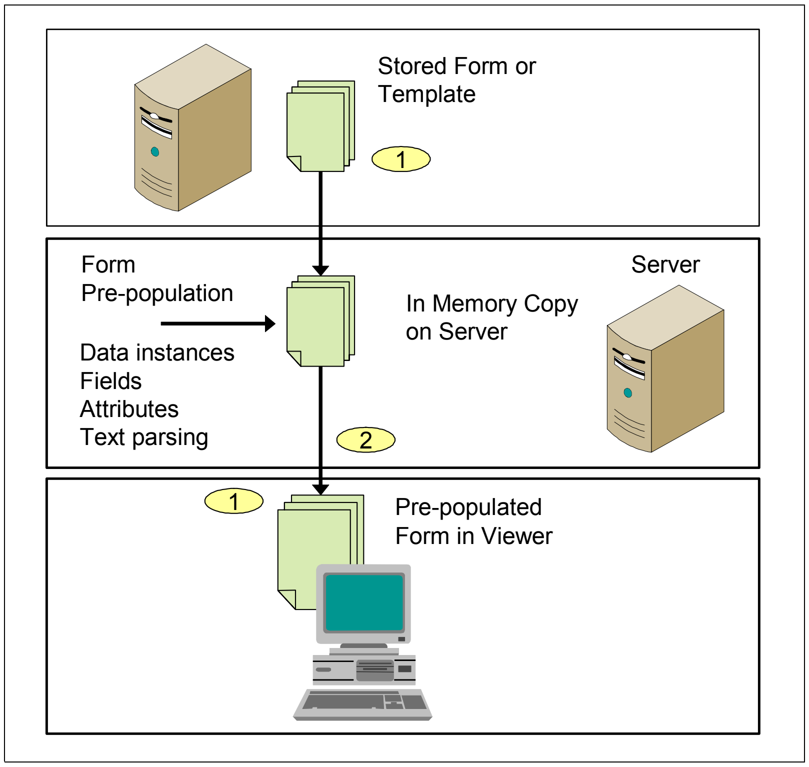


Figure 6-21 Server-side form prepopulation

The basic idea here is to get the original XFDL information (template), transform it by adding external data to the form, and then send it to the client. Assuming an invocation URL fired from the client browser to open a form, in a servlet environment, prepopulation usually occurs in the doGet method. The URL must now point to the servlet (not directly to the stored template on file system) and contain a reference to the chosen template.

Form download based on a POST action fired by a browser or another system is handled in the doPost method. This does not occur in our scenario, but it is possible to do so. The coding in Example 6-24 gives a simple example of how prepopulation can be done in the doGet method.

Example 6-24 Prepopulation executed in doGet servlet method updating XForms instance INST1

```
public void doGet(HttpServletRequest request, HttpServletResponse response)
      throws ServletException, IOException {
   try {
      //get the tem plate oath from the request parameter “template=”
      String formTemplate = request.getParameter("template");
      FileInputStream fis = new FileInputStream(formTemplate);

      XFDL theXFDL = IFSSingleton.getXFDL();
      FormNodeP theForm = theXFDL.readForm(fis,READFORM_XFORMS_INIT_ONLY);

      ....

      //Set some internal values like this
      //address the internal element to update using xforms specific pathes.
      String InstanceXML = “<value1>10000</value1>”;
      theForm.updateXFormsInstance(null, “instance(’INST1’)/value1” ,null,
         InstanceXML, XFDL.UFL_XFORMS_UPDATE_REPLACE);

      .....

      //Return the prepopulated form
      response.setContentType("application/vnd.xfdl");
      theForm.writeForm(response.getOutputStream(), null, 0);

   } catch (Exception doGetE) {
      System.out.println("SubmissionServlet: doGet: Exception processing request: "
                  + doGetE.toString());
      returnText(response,"SubmissionServlet: doGet: Exception occured: "
                  + doGetE.toString(), "text/plain");
   {
}
```

As discussed in stage 1, it is a best practice to access form data using data instances (as shown in the example above), not field values.

Example 6-25 shows how to address a field value synchronized with an XFDL data instance by position or by name. See the following data instance in the XFDL form (even though we are not using XFDL instances in this book).

Example 6-25 XFDL structure with the data instance OrderNumber/field ORD_ID to prepopulate

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<XFDL xmlns="http://www.PureEdge.com/XFDL/6.5" ..... >
   <globalpage sid="global">
      <global sid="global">
 .....
        <xmlmodel>
            <instances>
             ....
               <xforms:instance xmlns="" id="OrderNumber">
```

```
                    <OrderNumber>
                       <ORD_ID></ORD_ID>
                    </OrderNumber>
                 </xforms:instance>             ....
           </xmlmodel>
        <global>
     <globalpage>
```

To assign a value to this field ORD_ID in data instance OrderNumber, the code in Example 6-26 can be used (reference by position to the data instance).

Example 6-26 Assigning a value (orderNumber) to a form node in a XFDL data instance

```
   //theForm contains a reference to the form root node
   private static void setOrderNumber(FormNodeP theForm) throws UWIException {
   //get orderNumber from DB2
   String orderNumber = DB2ConnectionForms.getNewOrderNumber();
   //set ordernumber in data instance
   theForm.setLiteralByRefEx(null,
      "global.global.xmlmodel[xfdl:instances][7][null:OrderNumber][null:ORD_ID]",
      0, null, null, orderNumber);
   }
```

The code used is simple, but has one disadvantage: we cannot reference the data instance by name. All data instances have the tag name *instance* and no SID assigned. They are differentiated by the attribute ID. This attribute cannot be parsed by those methods as setLiteralByRefEx. As a result, we code a relative reference to the object:

```
global.global.xmlmodel[xfdl:instances][7][null:OrderNumber][null:ORD_ID]
```

Here, the part [7] indicates to access the eighth XFDL data instance. Adding or deleting data instances can break this reference.

There are at least two ways to overcome this problem. We can use a parsing algorithm to check all data instances in a loop for the required instance ID, detect the instance number, and write back data. This code is not shown here, but is possible to create. The other (and recommended) way is to use a dedicated API function for data instance updates operating with the instance ID as parameter. See the code in Example 6-27.

Example 6-27 Updating a data instance directly with an XML fragment

```
   private static void setOrderNumber(FormNodeP theForm) throws UWIException {
      //get db2 data as XML fragment
      String orderNumberXML = DB2ConnectionForms.getNewOrderNumberXML();
      //returns something like “<OrderNumber><ORD_ID>1000016</ORD_ID></OrderNumber>";

      //convert the String into a Stream
      StringReader sr = new StringReader(orderNumberXML) ;

      // update the instance by name
      // public void encloseInstance(theInstanceID,theStream,theFlags,theScheme,
      //    theRootReference,theNSNode,replaceNode)
      theForm.encloseInstance("OrderNumber", sr , 0, null, "[0]", null,true);
   }
```

The method encloseInstance overwrites an existing element in an instance with a new XML fragment. This makes it easy to update much more complex instances than this in the example. The only restriction for this method is to match exactly the tags in the updated elements to safe all existing bindings to other objects in the form. Be aware of the addressing used in the call. The parameter theRootReference is filled with "[0]" — a pointer to the first node inside the data instance. See Example 6-28 to understand this concept.

Example 6-28 XML fragment representing the data instance and the first element <OrderNumber>

```
<xforms:instance xmlns="" id="OrderNumber">
    <OrderNumber>
       <ORD_ID></ORD_ID>
    </OrderNumber>
  </xforms:instance>
```

The way this works is as follows:

1. The parameter theInstanceName (filled with the value "OrderNumber") points the update method to the Tag <xforms:instance xmlns="" id="OrderNumber">.
2. The parameter theRootReference filled with "[0]" points to the first inner element — that is, <OrderNumber> in the example.
3. This element and all child elements are updated (overwritten) by the update.

We found that when updating the complete instance, including the <xforms:instance> elements would cause namespace problems with the xforms namespace. So the recommended way is to update the root element or any inner elements only.

The following code snippets give you an idea of how to use the theRootReference parameter for internal addressing. All the samples below would work (Example 6-29).

Example 6-29 Different ways to address data instance objects

```
// set the entire first element in data instance - addressing by position
String orderNumberXML = "<OrderNumber><ORD_ID>1000016</ORD_ID></OrderNumber>";
StringReader sr = new StringReader(orderNumberXML) ;
theForm.encloseInstance("OrderNumber", sr , 0, null, "[0]", null,true);

// set the a named element in data instance - addressing by name
String orderNumberXML = "<OrderNumber><ORD_ID>1000016</ORD_ID></OrderNumber>";
StringReader sr = new StringReader(orderNumberXML) ;
theForm.encloseInstance("OrderNumber", sr , 0, null, "[0][null:ORD_ID]", null,true);

// set the value only - mixed addressing
String orderNumberXML = "<ORD_ID>1000016</ORD_ID>";
StringReader sr = new StringReader(orderNumberXML) ;
theForm.encloseInstance("OrderNumber", sr , 0, null, "[0][null:ORD_ID]", null,true);

// set the value only - addressing by position
String orderNumberXML = "<ORD_ID>1000016</ORD_ID>";
StringReader sr = new StringReader(orderNumberXML) ;
theForm.encloseInstance("OrderNumber", sr , 0, null, "[0][0]", null,true);
```

Using XForms instances, the reference to any inner elements of the instance is defined by XPath expression. See Example 6-30.

Example 6-30 XPath expressions referencing an XForms submission fragment

```
//This will update the entire instance
```

```
   String InstanceXML = “<data><value1>10000</value1></data>”;
      theForm.updateXFormsInstance(null, “instance(’INST1’)” ,null,
            InstanceXML, XFDL.UFL_XFORMS_UPDATE_REPLACE);

   //This will update the only the inner element named “value1” in the instance
   String InstanceXML = “<value1>10000</value1>”;
      theForm.updateXFormsInstance(null, “instance(’INST1’)/value1” ,null,
            InstanceXML, XFDL.UFL_XFORMS_UPDATE_REPLACE);

   //This will update the the third element named “elem” in the instance
   String InstanceXML = “<elem>10000</elem>”;
      theForm.updateXFormsInstance(null, “instance(’INST1’)/elem[2]” ,null,
            InstanceXML, XFDL.UFL_XFORMS_UPDATE_REPLACE);
```

Knowing how to prepopulate data, we can explore how to extract data from a submitted form.

6.5.4 Extraction of form data and storage of entire form

Extracting data from a form will be done as in the stage 1 doPost method. In stage 2, we:

- Extract much more data (state changes and order detail data).
- Complete the extracted data with additional history data (time stamps for approvals and approver IDs).
- Store the data to DB2.
- Store the entire form to DB2.

The main methods for data extraction stay the same as in stage 1. See the code in the extended scenario for doPost (Example 6-31). There are only a few parts to add for stage 2. You can finish, then search for comments containing:

```
//add for Stage 2
```

Example 6-31 Extended scenario for doPost

```
public void doPost(HttpServletRequest request, HttpServletResponse response)
   throws ServletException, IOException {
      System.out.println("SubmissionServlet: doPost started");

      //Initialize member variables
      String action = null; //Controls the processing action, response from
      // Servlet
      XFDL theXFDL = null; //The form
      FormNodeP theForm = null; //Represents nodes of the XFDL form
      String formString = null; //String representation of the form. Used for
      // the 'bounceback' feature.

      //Form State variables
      String formState = null; //The current state of the form
      String previousFormState = null; //The previous state of the form
      String formName = null; //Used in Stage 1 as the file name when
      // persisting the form to the file system

      /**
       * Processing. <BR>
       * Determine the type of request. Currently supported options include:
       * <BR>
       * 1) [listTemplates, null] Display 'listTemplates' JSP. This is the
       * default behavior if no action is specified. <BR>
```

```
    * 2) [listForms] Display 'listForms' JSP. <BR>
    * 3) [store] Store form, display 'submissionComplete' JSP. If needed,
    * the previous version is removed. <BR>
    * 4) [bounceback] For test purposes, returns the form as an text/xml
    * response page. <BR>
    */
   try {
      action = request.getParameter("action");
      if (action== null) action="";
      if (action.equalsIgnoreCase("bounceback")) {
         formString = Utils.getFormAsString(theForm);
      } else if (action.equalsIgnoreCase("store")) {
........................
........................
         String folderPath = props.getProperty(formState);

         ServletContext ctx = conf.getServletContext();
         String path = ctx.getRealPath(folderPath);
         Utils.writeBytesToFile(path + formName, Utils.getFormBytes(theForm));

         if (previousFormState == null) {
            System.out.println("SubmissionServlet: doPost: FormMetaData: ” +
               “ERROR: PreviousFormState element was null");
         } else if (previousFormState.equals(formState)){
            System.out.println("No state change");
         } else if (previousFormState.equalsIgnoreCase("2")
               || previousFormState.equalsIgnoreCase("3")
               || previousFormState.equalsIgnoreCase("5")) {
            System.out.println("SubmissionServlet: doPost: FormMetaData:” +
               “ previousFormState [       "+ previousFormState
                  + "] indicates previous file deletion is necessary");
            folderPath = props.getProperty(previousFormState);
            String previousFormPath = ctx.getRealPath(folderPath);
            File file = new File(previousFormPath + File.separator + formName);
            System.out.println("Deleting: " + previousFormPath + File.separator +
               formName);
            if (!(file == null)) file.delete();
         }

         //add for Stage 2 begin ======================
         /**
          * If the form is now approved, store the order information into
          * DB2, then store the entire form.
          */
         if (Utils.isRedbookForm(theForm)){
            if (formState == null) {
               System.out
               .println("SubmissionServlet: doPost: ERROR: formState is NULL");
            } else if (formState.equalsIgnoreCase("2")
                  || formState.equalsIgnoreCase("3")
                  || formState.equalsIgnoreCase("4")
                  || formState.equalsIgnoreCase("5")
                  || formState.equalsIgnoreCase("6")) {
               System.out
               .println("SubmissionServlet: doPost: ORDER APPROVAL DETECTED: " +
               "extracting order info from form");
               String[] orderData = Utils.extractOrderData(theForm, orderProps);
               Utils.printArray("OrderData", orderData);
               System.out
               .println("SubmissionServlet: doPost: ORDER Submission DETECTED: " +
                "storing order info into Database");
                Utils.writeOrderDatatoDB(orderData);
                System.out
                .println("SubmissionServlet: doPost: ORDER Submission DETECTED: " +
                "completed update of order info into Database.");
                //TODO: replace hard reference to array index
                String strXFDL = Utils.getFormAsString(theForm);
                Utils.writeFormToDB(orderData[0], strXFDL);
                System.out
                .println("SubmissionServlet: doPost: ORDER Submission DETECTED: " +
                "completed storage of XFDL Form into Database.");
             }//add for Stage 2 end =====================
          }
       } else {
          System.out
          .println("SubmissionServlet: doPost: specified action parameter value -->"
                + action
                + "<-- is not supported.  Currently the following are supported " +
          "[update, store, or blank which defaults to store.]");
          action = "unsupportedaction";
       }

........................
.....................
      }
      System.out.println("SubmissionServlet: doPost: completed.");
   }
```

The new code fragments use some helper functions created for stage 2 in the Utils class. They basically execute the form and handling for DB2.

The application in stage 2 stores the files in both the file system and the DB2 database (see method writeFormToDB). The corresponding code for DB2 storage is simple. It just calls the corresponding DB2ConnectionForms method. The method checks for any update or insert operations internally. The key for insert/update procedures is the first element of the orderData array containing the extracted data.

After this, the order state stored in DB2 is checked (lastOrderState). If any approvals are detected (new order state 3 or 4), the corresponding history fields are filled (Example 6-32).

Example 6-32 Code storing order data and entire form to DB2

```
/**
 * write (insert or update) metadate for one order
 *
 * @param orderData
 *           String table of all order data (field order must compare to
 *           column order in the table)
 */
public static void writeOrderDatatoDB(String[] orderData) {
   DB2ConnectionForms.writeOrderData(orderData);
}

/**
 * write (insert or update) the entire form as CLOB to DB2
 *
 * @param orderID
 * @param theForm as string
 */
public static void writeFormToDB(String orderID, String theForm) {
   DB2ConnectionForms.writeOrderXFDL(orderID, theForm);
}
```

The way to create an orderData array is straightforward here. We parse the FormOrderData instance using the API for registered field names in the orderdata.properties file in a loop and extract the values using the Utils.getFormValue function. This function extracts the appropriate value from the instance using XPath references like this:

```
instance('FormOrderData)/Amount
```

Code for extracting FormOrderInstance as an XML fragment can be seen in the Domino integration chapter. The working code fragment for the WebSphere Application Server (WAS) servlet is shown in Example 6-33.

Example 6-33 Extracting order data and detecting workflow state changes

```
/**
 * Extracts the order data from the form and creates an array
 * representation. <BR>
 * The elements and their order are defined in the order.properties file.
 *
 * @param theForm
 * @param orderProps
 * @return
 * @throws UWIException
 */
public static String[] extractOrderData(FormNodeP theForm,
      Properties orderProps) throws UWIException {
   int numElements = (new Integer(orderProps.getProperty("NUM_ELEMENTS")))
   .intValue();
   System.out
   .println("SubmissionServlet: extractOrderData: read number of elements “ +
         “from props file to be: "
         + numElements);
   String[] orderData = new String[numElements];
   String[] lastOrderData = new String[numElements];
   String orderState = "0";
```

```
    String lastOrderState = "0";
    GregorianCalendar cal = new GregorianCalendar();

    for (int i = 0; i < numElements; i++) {
       //Extract data from the form
       String propName = "ORDER_ELEMENT_NAME_" + i;
       System.out.println("SubmissionServlet: extractOrderData: " +
          "Constructed property name as: "+ propName);
       String propValue = orderProps.getProperty(propName);
       System.out.println("SubmissionServlet: extractOrderData: Lookup returned: "+
             propValue);
       String formValue = Utils.getFormValue(theForm, "instance('" +
             ORDERDATA_INSTANCE_ID+ "')/" + propValue , "stripe");
       if (propValue.equals("CustomerID"))
          formValue = DB2ConnectionForms.extractID(formValue);
       orderData[i] = formValue;
       System.out.println("SubmissionServlet: extractOrderData: Update element ["
             + i + "] with value [" + orderData[i] + "]");
    }

    // read the state, get last state and check for history fields to write
    orderState = orderData[5];
    lastOrderState = Utils.getFormValue(theForm, "instance('" + METADATA_INSTANCE_ID+
       "')/PreviousState"  , "stripe");
    if (lastOrderState.equals("")) lastOrderState = "0";
    System.out.println("lastOrderState: " + lastOrderState);
    if ((orderState.equals("3") || orderState.equals("4"))
          && (lastOrderState.equals("2"))) {
       System.out.println("MGR approval");
       orderData[11] = currentDate(); //app date mgr
       orderData[12] = "accepted by manager"; //comment mamager
       System.out.println("MGR approval OK");
    } else if (orderState.equals("4") && (lastOrderState.equals("3"))) {
       System.out.println("DIR approval");
       orderData[14] = currentDate();
       orderData[15] = "accepted by director";
       System.out.println("DIR approval OK");
    } else if (orderState.equals("4") && (!lastOrderState.equals("4"))) {
       System.out.println("AUTO approval");
       System.out.println("AUTO approval OK");
    }
    if (orderState.equals("4") && (!lastOrderState.equals("4")))
       orderData[7] = currentDate();
    if (lastOrderState.equals("0"))
       orderData[6] = currentDate();

    return orderData;
 }


 /**
  * gets data in the xfdl form addressed by an item reference
  * dependent on the syntax in pathToItem parameter, the code will access an
  * XFDL item or data in an XForms instance
  *
  * @param theForm the xfdl form
  * @param pathToItempath (or XPath expression) to the item to read
  * @param returnMode"stripe" will stripe the outer element of the
  *          returned instance
```

```
    *         all other values will return the value or instance "as is"
    * @return the value of the item
    */
   public static String getFormValue(FormNodeP theForm, String pathToItem, String
returnMode) {
      String ret = "";
      try {
         if (pathToItem.indexOf("instance('") == 0){
            p ("try extraxt XForms instance: " + pathToItem );
            //extract from XForms instance

            StringWriter sw = new StringWriter();
            //extract data instance from xfdl as StringWriter
            theForm.extractXFormsInstance(null, pathToItem ,false, true,
               null, sw);
            p(" xforms instance extracted");
            //read extracted instance to String ret
            ret = sw.toString();
            if ((!ret.equals("")) && returnMode.equals("stripe")){
               ret = ret.substring(ret.indexOf(">")+1, ret.lastIndexOf("<"));
            }
         } else {
            //extract an item value
            p(" read form item: " + pathToItem);
            ret = theForm.getLiteralByRefEx(null, pathToItem, 0, null, null);
            if (ret == null) {
               p("value not found");
               ret = "";
            }
         }


      } catch (UWIException e) {
         p ("FAILED to read XForms instance: " + pathToItem );
         e.printStackTrace();
      }
      p("getFormValue: " + pathToItem + " mode" + returnMode + "value: '" +
            ret + "'");
      return ret;
   }
```

For details on the workflow state meanings see 6.7.2, “Approval workflow” on page 443.

6.5.5 Reading form data from DB2

Having at least one form submitted and stored in DB2, we can work on the read procedure to read the form on any subsequent form invocation (such as for an approval or further processing in other applications).

The dirlist.jst just exposed a link to the browser pointing to the XFDL file on the file system. Clicking the link, the file is downloaded without any interaction with the servlet. This is going to change, since we will prepopulate some values in this scenario. The place to modify is doGet method. In stage 1, this method does not access the form at all. Now we have to implement an additional action (showForm) with an additional parameter (orderNumber) to retrieve the form and send it to the browser.

The differences from the new order scenario in stage 1 are as follows:

- The new order scenario reads the template from the file system as in stage 1. We read the submitted form when re-opened from DB2 now.
- The new order scenario does form data prepopulation. Reopened forms are not changed when they are opened except for setting the submission URL pointing the active servlet.

We insert additional code into the doGet method detecting the value “showForm” in the `if... else if ...` chain evaluation for the action parameter processing form load for re-opened forms previously stored in DB2 (Example 6-34).

Example 6-34 Additional code to read XFDL form DB2 and send to the Viewer

```
.....
        //insert in ... else if ... chain evaluation for the action parameter

           //add for Stage 2 begin ======================
        } else if (action.equalsIgnoreCase("showForm")) {
           System.out
           .println("SubmissionServlet: doGet: detected -->showForm<-- request.");
           String orderNumber = request.getParameter("orderNumber");
           if (orderNumber == null) {
              Utils.returnText(response,
                    "SubmissionServlet: for showForm, parameter orderNumber “ +
                    “must not be null.", "text/plain");
           } else {
              System.out
              .println("SubmissionServlet: doGet: showForm: orderNumber = "+
                 orderNumber);
              //Load Form From DB
              String formString = DB2ConnectionForms.readRowXFDL(orderNumber);
              System.out.println("SubmissionServlet: doGet: showForm: “ +
                    “loaded form from DB2.  Length = "+ formString.length());
              //Obtain the Form Template
              XFDL theXFDL = IFSSingleton.getXFDL();

              ByteArrayInputStream str =
                 new ByteArrayInputStream(formString.getBytes("UTF-8"));
              //since we read / write only entirs instances, we can turn server
              //speed flags on.
              FormNodeP theForm = theXFDL.readForm(str,READFORM_XFORMS_INIT_ONLY);
              //FormNodeP theForm = theXFDL.readForm(str,0);
              str.close();

              if (Utils.isRedbookForm(theForm)){
                 //Set user info and return url in the form
                 String submissonURL =  request.getRequestURI()+"?action=store";
                 Utils.setConfigurationInfo(theForm, userID,
                    (String)request.getAttribute("userRole"),
                    submissonURL, XFormsSubmissionURL);
              }
              //Return the pre-populated form
              Utils.returnForm(response, theForm);
              //cleanup
              theForm.destroy();
              return;
           }
        } else if (action.equalsIgnoreCase("prePop")) {
.....
```

The called returnForm helper method is already used in the prepopulation scenario for new forms from the template. The code assumes a URL to the servlet like this:

```
http://servername:port/servlerPath?action=showForm&orderNumber=XXXXX
```

The inserted code retrieves the order number, reads the for data using the readRowXFDL method, and returns the form to the client. To create suitable URLs, a new JSP is required (db2listing.jsp). It reads DB2 data for all available forms, renders it in a table for browser display, and creates the appropriate links to open the forms.

The new method Utils.setConfigurationInfo will update the submission servlet URL, the user name, and the user role in the form on each for open, so the form can be used without changes in different environments. The submission URL will always point back to the servlet sending the form to the client. For this purpose, we have created a dedicated instance in the form, storing for test purposes in design time the URLs of the local J2EE environment. (You will find in this instance the same additional settings used for the Domino scenario later on.)

Example 6-35 ConfigurationInfo instance storing environment settings populated on each form open

```
<!-- Form Configuration Parameters -->
   <xforms:instance id="ConfigurationInfo" xmlns="">
      <ConfigurationInfo><XFDLSubmissionURL>
         http://localhost:9080/WPForms261Stage2/SubmissionServlet?action=store
      </XFDLSubmissionURL>
      <XFormsSubmissionURL>
         http://localhost:9080/WPForms261RedbookXForms/XFormsSubmissionServlet?
      </XFormsSubmissionURL>
      <UserName>Test User</UserName>
         <!-- fill in prepopulation: name of the user working curently on the form -->
      <UserRole>tester</UserRole>
         <!-- fill in prepopulation:  role of the user working curently on the form -->
      <InstanceID>FormOrderData</InstanceID>
         <!-- fill in prepopulation:  ID of the xforms instance to retrieve on form submit-->
      <DominoForm></DominoForm>
         <!--  fill in prepopulation: form alias of the Domino document to create for
               submitted forms -->
      <DbPath></DbPath>
         <!--  fill in prepopulation: path to Domino database to store submitted forms -->
      <FormID></FormID>
         <!--  fill in prepopulation or on first submit: ID of the domino document to
            store submitted forms -->
   </ConfigurationInfo>
</xforms:instance>
```

The code inserting the environment values utilizes the already shown function Utils.setFormValue.

Example 6-36 Java method setting the configuration info instance on from open from the servlet

```
   public static void setConfigurationInfo(FormNodeP theForm, String userID,
String userRole, String servletURL, String XFormsSubmissionURL) throws
UWIException {

      System.out.println("set user info: " + userID + " role: " + userRole);

      //Cannot process partial update when server speed flags are set
            -> update the entire instance
      //Utils.setFormValue(theForm, "instance('" + CONFIG_INSTANCE_ID +
            "')/UserName", userID );
      //Utils.setFormValue(theForm, "instance('" + CONFIG_INSTANCE_ID +
            "')/UserRole", userRole );

      String instXML = getFormValue(theForm, "instance('" + CONFIG_INSTANCE_ID +
            "')", "");
      instXML = setXMLElement(instXML, "UserName", userID);
      instXML = setXMLElement(instXML, "UserRole", userRole);
      if (! XFormsSubmissionURL.equals("")){
         instXML = setXMLElement(instXML, "XFormsSubmissionURL",
            XFormsSubmissionURL);
      }
      if (! servletURL.equals("")){
         instXML = setXMLElement(instXML, "XFDLSubmissionURL", servletURL);
      }

      System.out.println("New Configuration: " + instXML);
      setFormValue(theForm, "instance('" + CONFIG_INSTANCE_ID + "')", instXML);
      System.out.println("SubmissionServlet: doGet: prePop: completed setting
current user info into form");

   }
```

Developing this part of the application, we found that there are problems updating or even reading parts of an instance with turned server speed flags on in the form object. See the related instruction in the code:

```
FormNodeP theForm = theXFDL.readForm(fis,XFDL.UFL_SERVER_SPEED_FLAGS);
```

The behavior seemed to depend on the inner structure of the data instance, but we could not figure out I the exact conditions for the error messages. There where two possible solutions:

- Turn server speed flags off or assign custom flags (what might reduce the performance in prepopulation and value extraction, since after each value update, the computing engine would reevaluate all computes in the form).
- Read and write only complete instances.

Initially we took the first approach (turn server speed flags on), since this was easy to do and had only minimal impact to the code already created. Having done so, we found new challenges. The actions activating the Xforms submissions on page load tried to fire already in prepopulation time, when we accessed the form using the API. This results in an error message `This function is currently not implemented`, and theForm object stayed null.

Next we tried the other way. We moved the code to read/write entire submissions only. See the commented code lines in the example above (`//Cannot process partial update when server speed flags are set....`).

Later on we found that forms containing signatures cannot open with server_speed_flags turned off. We got an error here stating `Invalid Parameters` with no specification of what parameters are wrong. So the final solution was to assign a special set of flags, as shown in Example 6-37. (See details in 5.11.7, "Extraction of form data" on page 339.)

Example 6-37 Finally used construction to open XFDL forms

```
private static final int READFORM_XFORMS_INIT_ONLY = (XFDL.UFL_SERVER_SPEED_FLAGS
& (~XFDL.UFL_XFORMS_OFF) | XFDL.UFL_XFORMS_INITIALIZE_ONLY);
```

```
// Load the form
XFDL theXFDL = null;
theXFDL = IFSSingleton.getXFDL();
p(  "IFSSIngelton OK");
 if(theXFDL == null) throw new Exception("Could not find interface");
try {
   //first try as usually - preformance matters
   FormNodeP theForm = theXFDL.readForm(filePath,
                                    READFORM_XFORMS_INIT_ONLY);
} catch {
   System.out.println("Could not open the form ....");
   ....
   }
```

6.6 Adjustments to JSPs for stage 2

In this section we explain adjustments to the JSPs for stage 2.

6.6.1 Where we are in the process: building stage 2 of the base scenario

Figure 6-22 is an overview of where we are within the key steps involved to build stage 2 of the base scenario. This focuses on adding storage capabilities to DB2, incorporating Web services, modifying the JSPs, and adding an approval workflow.

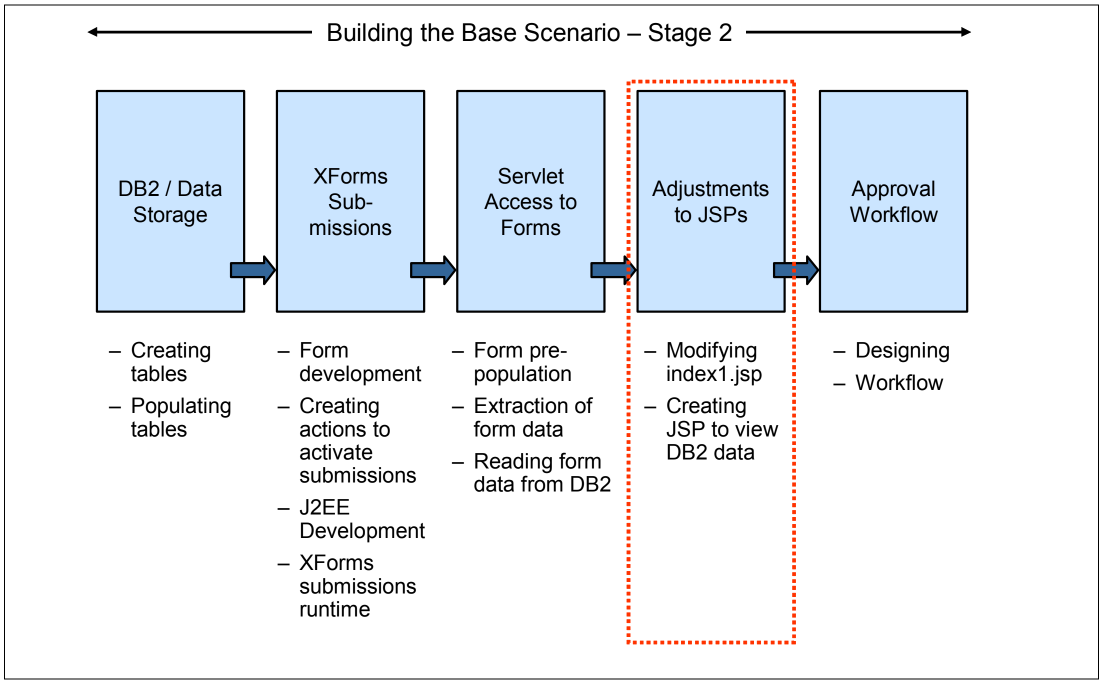


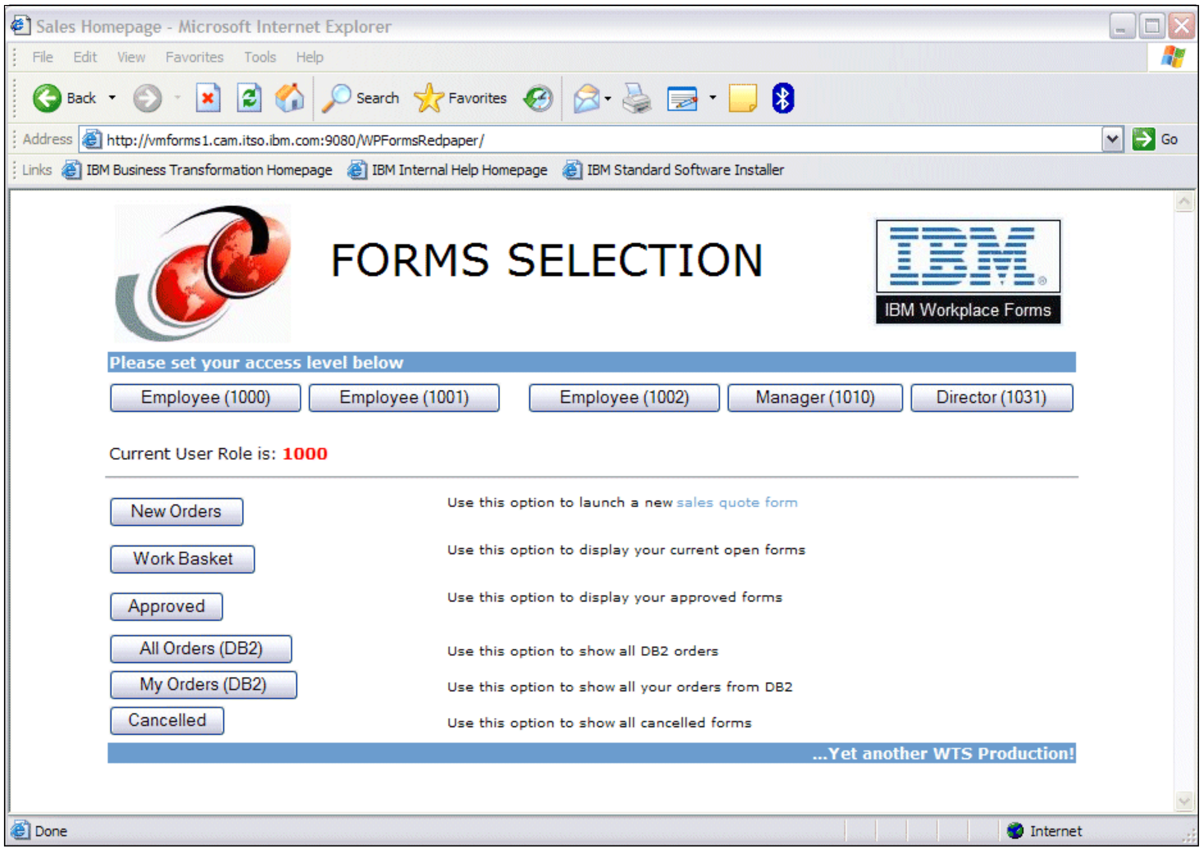
Figure 6-22 Overview of major steps involved in building stage 2 of base scenario application

6.6.2 Modifying the index.jsp

There are two additional buttons that you need to add to the *index.jsp* in order to connect to DB2:

- All Orders (DB2): This button submits a request to the *db2listing.jsp*, which returns all of the orders in the DB2 database.
- My Orders (DB2): This button submits a request to the *db2listing.jsp*, which returns only the orders of the user making the request in the DB2 database.

Figure 6-23 shows what the final JSP is going to look like.


Sales Homepage - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://vmforms1.cam.itso.ibm.com:9080/WPFormsRedpaper/
Go
Links IBM Business Transformation Homepage IBM Internal Help Homepage IBM Standard Software Installer
FORMS SELECTION
IBM
IBM Workplace Forms
Please set your access level below
Employee (1000)
Employee (1001)
Employee (1002)
Manager (1010)
Director (1031)
New Orders
Work Basket
Approved
All Orders (DB2)
My Orders (DB2)
Cancelled
...Yet another WTS Production!
Done
Internet

Current User Role is: 1000

Use this option to launch a new sales quote form

Use this option to display your current open forms

Use this option to display your approved forms

Use this option to show all DB2 orders

Use this option to show all your orders from DB2

Use this option to show all cancelled forms

Figure 6-23 index.jsp

These are the steps to add these buttons:

1. Open *index.jsp* using your application development tool.
2. In the HTML for the Forms Access button table, add the code shown in Example 6-38.

Example 6-38 Code to add the DB2 buttons

```
<TR>
   <TD>
   <FORM method=get action="db2listing.jsp">
   <INPUT type="submit" value="All Orders (DB2)">
   </TD>
   <TD><FONT size="-2">Use this option to show all DB2 orders</FONT>
   </TD>
   </FORM>
   </TD>
</TR>
<TR>
   <TD>
   <FORM method=get action="SubmissionServlet">
   <INPUT type="submit" value="My Orders (DB2)">
   <INPUT type="hidden" name=action value="getJSP">
   <INPUT type="hidden" name=jsp value="db2listing.jsp">
   </TD>
   <TD><FONT size="-2">Use this option to show all your orders from DB2</FONT>
   </TD>
   </FORM>
   </TD>
</TR>
```

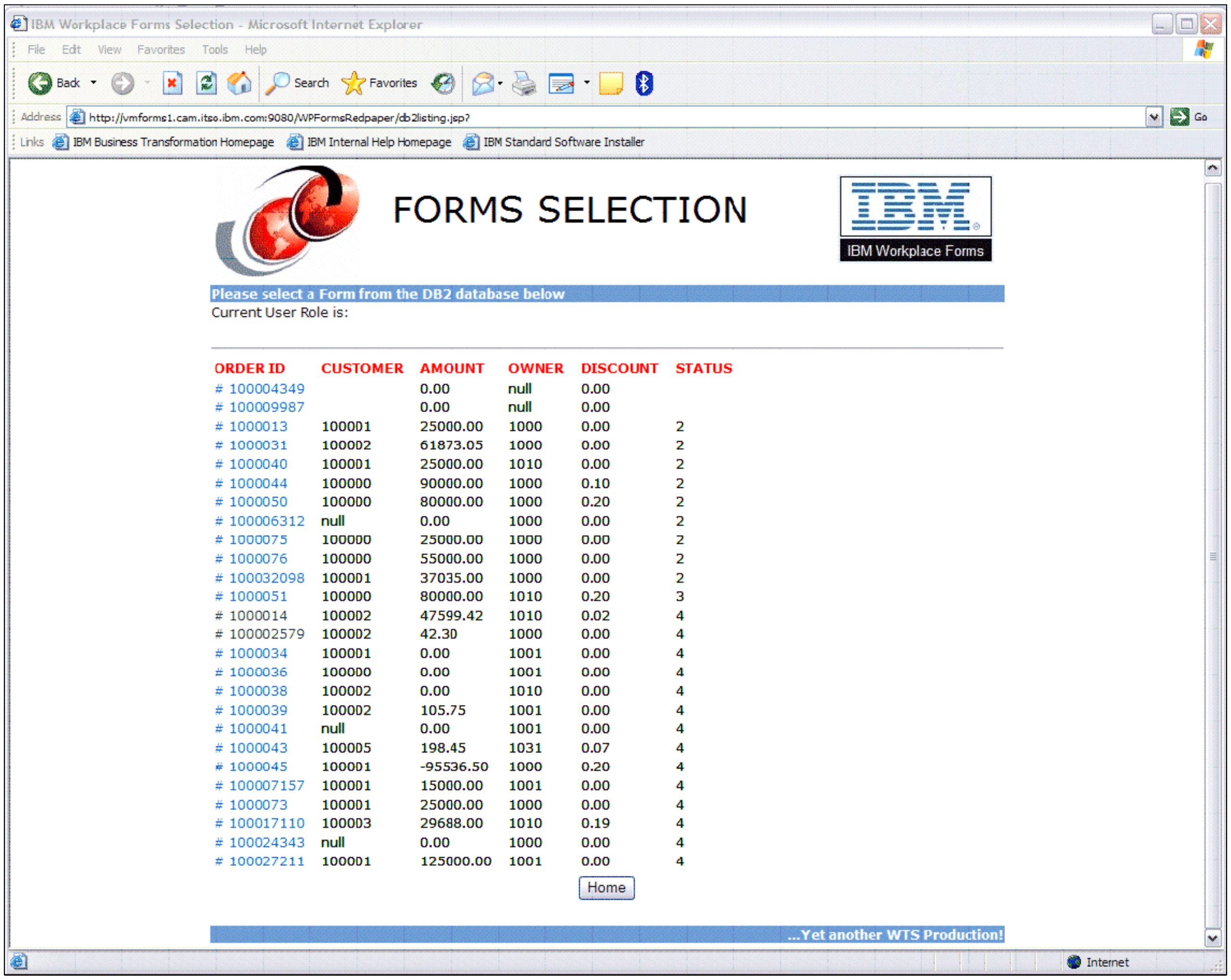
3. Save the updated file as *index.jsp* so as to separate this from the original *index.jsp.*

6.6.3 Creating a JSP to view DB2 data

In order to display the data from the DB2 database, you need to create a JSP that reads the data from the tables and creates the output in HTML format. This JSP uses the DB2 Access Layer connector mentioned previously in 5.1.5 to make the queries to the database and to store the form back.

The *db2listing.jsp* has a similar function to the *dirlisting1.jsp* mentioned in Chapter 4, “Approaches to integrating Workplace Forms” on page 151. The main difference is that the forms in this example are stored in a table in DB2 and not on the file system. This JSP is used two different ways. The first scenario is from the *index.jsp* where a user has the option to select the button **All Orders (DB2)**. This button does not pass in any userID information to the servlet, and all data from the database is returned. The second time that this JSP is called is from the My Orders (DB2) button. In this case, the userID is passed to the JSP from the servlet, and only those forms that the user has created will be displayed.

Figure 6-24 shows what the All Orders view from the *db2listing.jsp* looks like.


IBM Workplace Forms Selection - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://vmforms1.cam.itso.ibm.com:9080/WPFormsRedpaper/db2listing.jsp?
Go
Links IBM Business Transformation Homepage IBM Internal Help Homepage IBM Standard Software Installer
FORMS SELECTION
IBM Workplace Forms
Home
...Yet another WTS Production!
Internet

Please select a Form from the DB2 database below

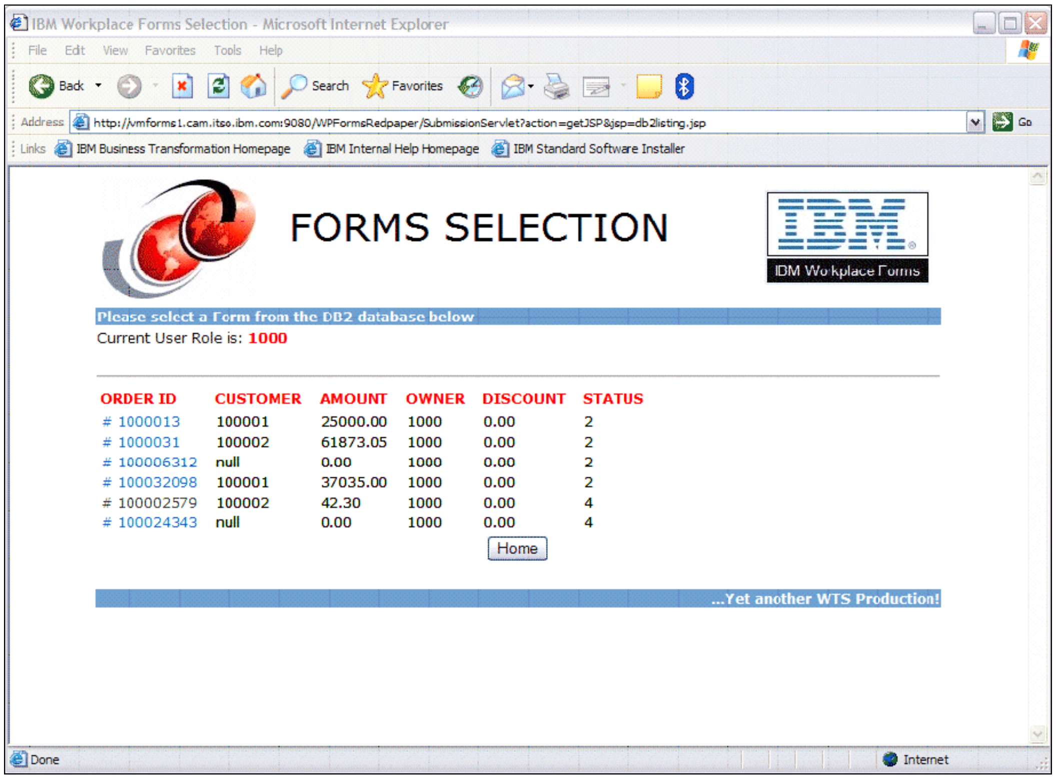
Current User Role is:

ORDER ID	CUSTOMER	AMOUNT	OWNER	DISCOUNT	STATUS
# 100004349		0.00	null	0.00	
# 100009987		0.00	null	0.00	
# 1000013	100001	25000.00	1000	0.00	2
# 1000031	100002	61873.05	1000	0.00	2
# 1000040	100001	25000.00	1010	0.00	2
# 1000044	100000	90000.00	1000	0.10	2
# 1000050	100000	80000.00	1000	0.20	2
# 100006312	null	0.00	1000	0.00	2
# 1000075	100000	25000.00	1000	0.00	2
# 1000076	100000	55000.00	1000	0.00	2
# 100032098	100001	37035.00	1000	0.00	2
# 1000051	100000	80000.00	1010	0.20	3
# 1000014	100002	47599.42	1010	0.02	4
# 100002579	100002	42.30	1000	0.00	4
# 1000034	100001	0.00	1001	0.00	4
# 1000036	100000	0.00	1001	0.00	4
# 1000038	100002	0.00	1010	0.00	4
# 1000039	100002	105.75	1001	0.00	4
# 1000041	null	0.00	1001	0.00	4
# 1000043	100005	198.45	1031	0.07	4
# 1000045	100001	-95536.50	1000	0.20	4
# 100007157	100001	15000.00	1001	0.00	4
# 1000073	100001	25000.00	1000	0.00	4
# 100017110	100003	29688.00	1010	0.19	4
# 100024343	null	0.00	1000	0.00	4
# 100027211	100001	125000.00	1001	0.00	4

Figure 6-24 All orders from DB2 using db2listing.jsp

Note: The values in the STATUS column on the right-hand side of the screen refer to the workflow stage, which we talk about in 6.7.2, “Approval workflow” on page 443.

Figure 6-25 shows what the My Orders view from the *db2listing.jsp* looks like.



FORMS SELECTION

Please select a Form from the DB2 database below

Current User Role is: **1000**

ORDER ID	CUSTOMER	AMOUNT	OWNER	DISCOUNT	STATUS
# 1000013	100001	25000.00	1000	0.00	2
# 1000031	100002	61873.05	1000	0.00	2
# 100006312	null	0.00	1000	0.00	2
# 100032098	100001	37035.00	1000	0.00	2
# 100002579	100002	42.30	1000	0.00	4
# 100024343	null	0.00	1000	0.00	4

...Yet another WTS Production!

IBM Workplace Forms Selection - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back
Search
Favorites
Address http://vmforms1.cam.itso.ibm.com:9080/WPFormsRedpaper/SubmissionServlet?action=getJSP&jsp=db2listing.jsp
Go
Links IBM Business Transformation Homepage IBM Internal Help Homepage IBM Standard Software Installer
IBM Workplace Forms
Home
Done
Internet

Figure 6-25 My Orders from DB2 view using db2listing.jsp

Follow these steps:

1. Create a new JSP named `db2listing.jsp` and save it to the WebContent folder on the Web server.
2. Copy the code in Example 6-39 into the JSP. Example 6-39 shows the code to get the tables from DB2 and then create an HTML table with the metadata values and a link to the forms that are stored in the database.
3. Save and close the new JSP.

Example 6-39 Code to create db2listing.jsp

```
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=ISO-8859-1">
<meta http-equiv="Content-Style-Type" content="text/css">
<link rel="stylesheet" href="theme/blue.css" type="text/css">
<title>IBM Workplace Forms Selection</title>
</head>

<CENTER>
<TABLE border="0" cellpadding="2" width="760" >
   <TBODY>
      <TR>
         <TD><IMG border="0" src="theme/redbook_logo.jpg" width="138"
            height="114" align="left"></TD>
         <TD align="left"><H1>FORMS SELECTION</H1></TD>
         <TD><IMG border="0" src="theme/Workplace_Forms.jpg" width="158"
            height="92" align="right"></TD>
      </TR>
   </TBODY>
</TABLE>
</CENTER>

<%@ page session="false" contentType="text/html"
   import="java.util.*, java.io.File"%>

<!-- import DB2 connection library to make order query
DB2ConnectionForms.getOrderListEmp(userID) available -->
<%@ page import="forms.cam.itso.ibm.com.DB2ConnectionForms"%>

<TABLE border="0" width="760" align="center">
   <TR>
      <TD bgcolor="#699ccf"><B>Please select a Form from the DB2 database below</B><BR>
      </TD>
   </TR>
   <TR>
      <TD>
      <%
String userID = (String) request.getAttribute("userRole");

if (userID == null) userID = "";
String [][] resArr = DB2ConnectionForms.getOrderListEmp(userID);

String html = "Current User Role is: <STRONG>" + userID + "</STRONG><P><HR>";

html = html + "<TABLE cell padding=5>";
String n = "<TD>&nbsp;&nbsp;</TD>";
 String projectName = "WPForms261Stage2";

html = html + "<TD><STRONG>ORDER
ID</STRONG></TD>"+n+"<TD><STRONG>CUSTOMER</STRONG></TD>"+n+"<TD><STRONG>AMOUNT</STRONG></TD
>"+ n;
html = html +
"<TD><STRONG>OWNER</STRONG></TD>"+n+"<TD><STRONG>DISCOUNT</STRONG></TD>"+n+"<TD><STRONG>STA
TUS</STRONG></TD>";
for (int i = 0; i < resArr.length; i++){
html = html + "<TR>";
html = html + "<TD>";
html = html + "<A href=/" + projectName +
"/SubmissionServlet?action=showForm&amp;orderNumber=" + resArr[i][0]+">#
"+resArr[i][0]+"</A>";
html = html + "</TD>"+n;
html = html + "<TD>" + resArr[i][1] + "</TD>"+n;
html = html + "<TD>" + resArr[i][2] + "</TD>"+n;
html = html + "<TD>" + resArr[i][4] + "</TD>"+n;
html = html + "<TD>" + resArr[i][3] + "</TD>"+n;
html = html + "<TD>" + resArr[i][5] + "</TD>";
html = html + "</TR>";
}
html = html + "</TABLE>";
 %>
 <%=html %>

      </TD>
   </TR>
<TR>

      <TD align="center">
      <FORM method=get action="SubmissionServlet">
      <INPUT type="submit" value="Home">
      <INPUT type="hidden" name=action value="getJSP">
      <INPUT type="hidden" name=jsp value="index.jsp">
      </FORM>

</TR>
</TABLE>

<TABLE width="760" align="center">
 <tr bgcolor="#699ccf">
        <td align="right"><B>...Yet another WTS
               Production!</B></td>
      </tr>
</TABLE>
```

Created links

Table 6-12 and Table 6-13 illustrate the links generated within dirlisting.jsp and db2listing.jsp.

Table 6-12 Examples for the generated actions in dirlisting.jsp (stage 2)

	Generated URL
RAD 6 test environment	
New form	`http://localhost:9080/WPFormsRedpaper/SubmissionServlet?action=prepop&template=C:\WEBSPH~1\APPSER~1\installedApps\vmforms1\Forms261Stage2EAR.ear_war.ear\Forms261Stage2EAR.ear.war\Redpaper_Demo\Form_Templates\Redpaper_Forms_Sample_S2_v41.xfdl`
Open stored form	Not available (processed by db2listing.jsp)
Deployed application	
New form	`http://vmforms261.cam.itso.ibm.com:10000/WPForms261Stage2/SubmissionServlet?action=prepop&template=C:\ibm\WebSphere\profiles\wp_profile\installedApps\vmfor\Forms261Stage2EAR.ear\WPForms261Stage2.war\Redpaper_Demo\Form_Templates\Simple_Test_Form.xfdl`
Open stored form	Not available (processed by db2listing.jsp)

Table 6-13 Examples for the generated actions in db2listing.jsp (stage 2)

	Generated URL
RAD6 test environment	
New form	Not available (processed by dirlisting.jsp)
Open stored form	`http://localhost:9080/Forms261Stage2/SubmissionServlet?action=showForm&orderNumber=1000044`
Deployed application	
new form	Not available (processed by dirlisting.jsp)
open stored form	`http://vmforms261.cam.itso.ibm.com:10000/WPForms261Stage2/SubmissionServlet?action=showForm&orderNumber=1000011`

6.7 Workflow

In this section we consider the workflow in our sample application.

6.7.1 Where we are in the process: building stage 2 of the base scenario

Figure 6-26 is an overview of where we are within the key steps involved to build stage 2 of the base scenario. This focuses on adding storage capabilities to DB2, incorporating Web services, modifying the JSPs, and adding an approval workflow.

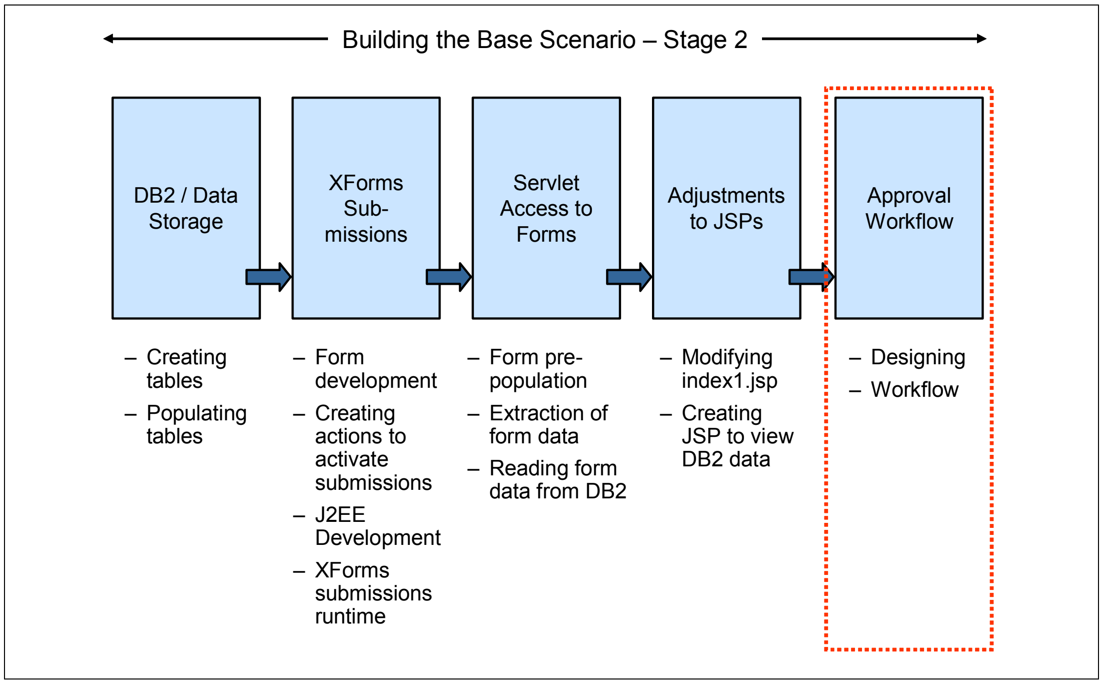


Figure 6-26 Overview of major steps involved in building stage 2 of base scenario application

6.7.2 Approval workflow

To bring our sample application closer to a real-life scenario, we design an approval workflow that assigns different approval levels to the sales quote according to thresholds or business rules that we prepopulate into the form.

Figure 6-27 illustrates an overview of the workflow and business logic contained within the application.

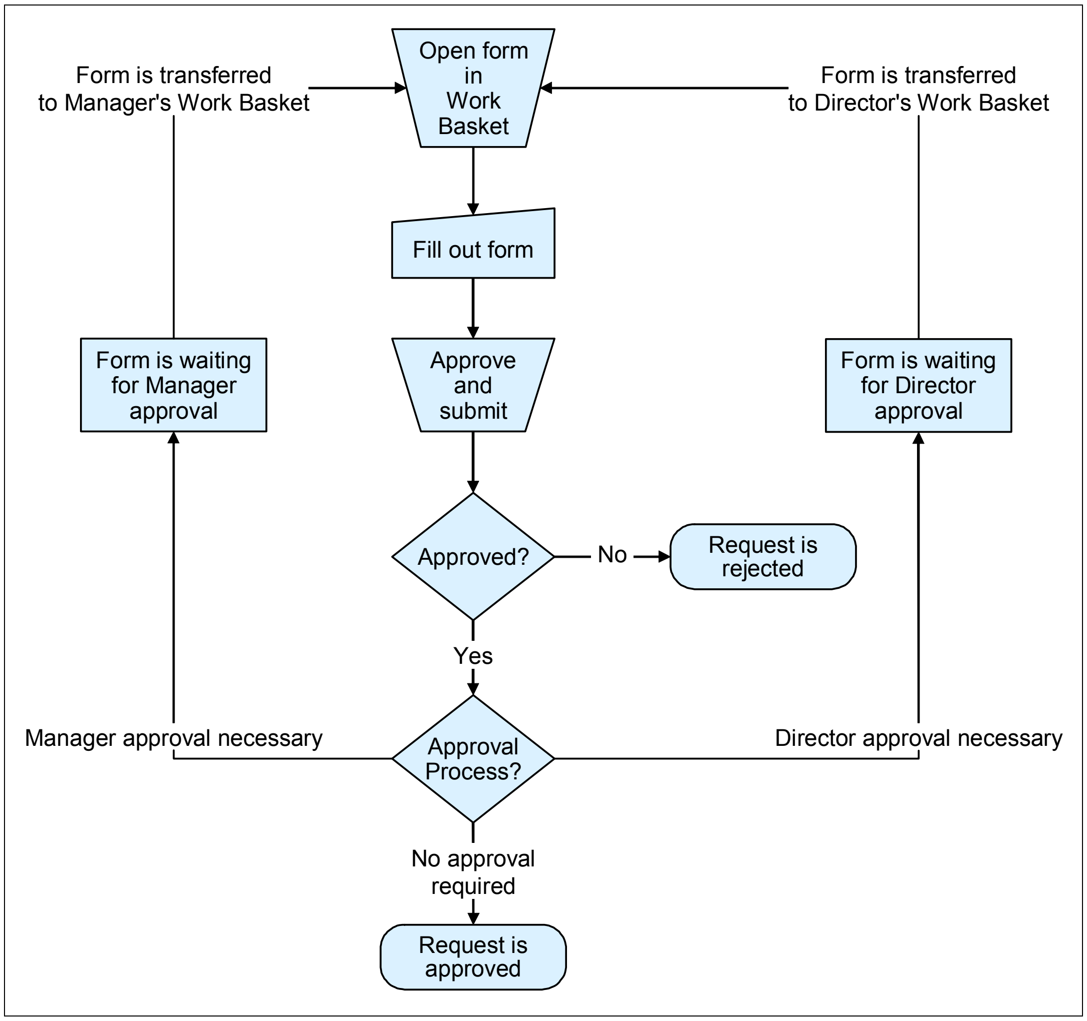

Open form in Work Basket
Form is transferred to Manager's Work Basket
Form is transferred to Director's Work Basket
Fill out form
Form is waiting for Manager approval
Approve and submit
Form is waiting for Director approval
Approved?
No
Request is rejected
Yes
Manager approval necessary
Approval Process?
Director approval necessary
No approval required
Request is approved

Figure 6-27 Overview of workflow for sample application

The workflow is comprised of the following stages:

1. Template (internal state 1)
2. Waiting for manager approval (internal state 2)
3. Waiting for director approval (internal state 3)
4. Approved (internal state 4)
5. Rejected (internal sate 6)
6. Draft (internal state 5)

The different approval levels are assigned to three roles of users accessing the form:

- Requestor
- Manager level approver
- Director level approver

Figure 6-28 shows the workflow stages and the basic flow.

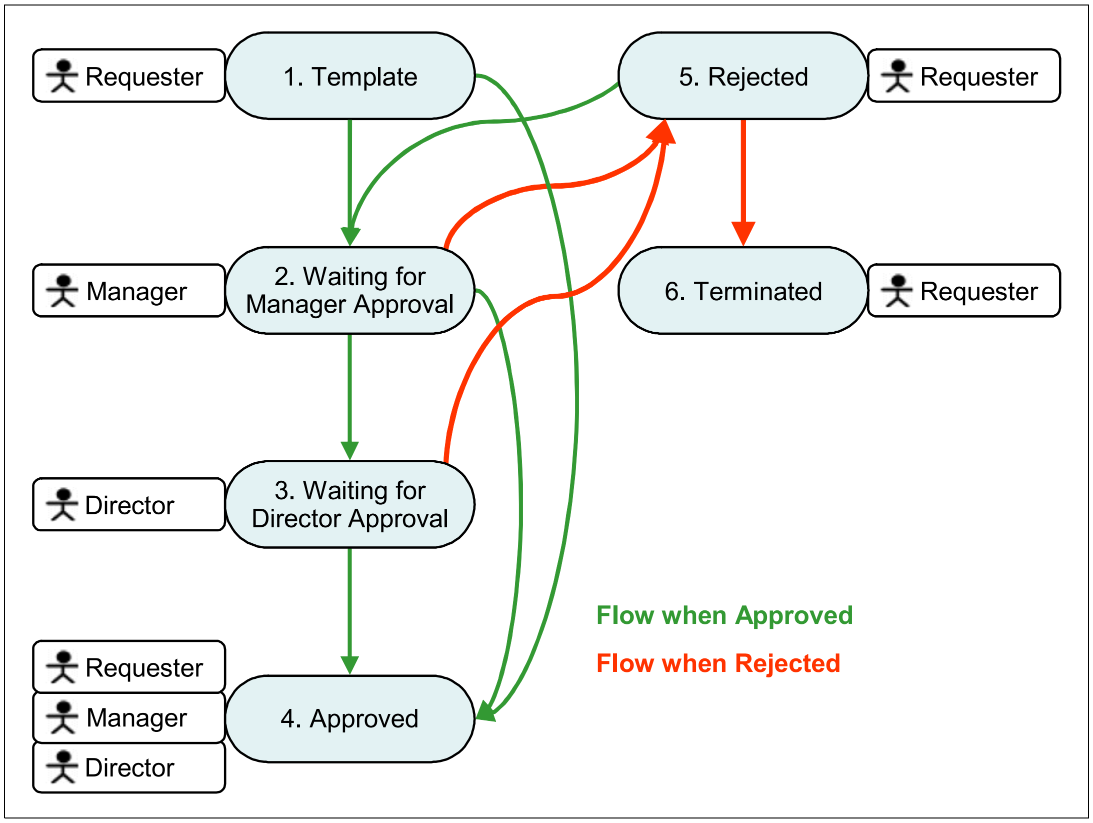


Figure 6-28 Workflow stages, access roles, and basic flow

We are doing the workflow processing when a user signs the form. The signature buttons hold different custom computes that set two fields of the form (State and PreviousState) to the appropriate states depending on the business rules. The business rules are also prepopulated by the servlet and have the following rule set:

- If the total amount of the sales quote is less than $10.000, the form is approved when the requestor signs it.
- If the total amount is between $10,000 and $50,000, a manager level approval is necessary to approve the quote.
- If the total amount is greater than $50,000, a sequential signing with manager and director level approval is necessary to approve the quote.

The threshold values are stored in a data instance and updated on first form load (when the form is created from the template).

Example 6-40 shows the custom compute on the requestor's signature button to process the form within the workflow. The computes on the other two signature buttons work in the same fashion to control the workflow in the higher stages.

When the form is submitted, the servlet reads the values for State and PreviousState from the data instance to store the form in the corresponding folder or workbasket of the respective role that has to take action. Thereby, the control over the workflow remains in the business logic within the form.

Example 6-40 Custom compute on the requestor's signature button to process the form in the workflow

```
<button sid="OriginatorSignatureBUTTON">
         <itemlocation>
            <x>596</x>
            <y>755</y>
            <width>255</width>
            <height>26</height>
            <after>LABELOriginatorsPosition1</after>
            <alignvertc2c>LABELOriginatorsPosition1</alignvertc2c>
         </itemlocation>
         <value compute="signer=='' ? 'Originator Signature' : signer">Originator Signature</value>
<!-- Set the value for Approval comment if signed -->
          <custom:SetSubmitterID xfdl:compute=" &#xA;
           toggle(signer) == '1' &#xA;
              ? (signer != '' &#xA;
                  ? (set('SUBMITTERID1.value', get('instance(\'EmployeeDetails\')/Employee/ID', '',
                          'xforms')) &#xA;
                     + set('instance(\'FormMetaData\')/Owner',
                          get('instance(\'EmployeeDetails\')/Employee/ID', '', 'xforms'), '',
                             'xforms') &#xA;
                     + set('instance(\'FormMetaData\')/CreationDate', date(), '', 'xforms')&#xA;
                     ) &#xA;
                  : (set('SUBMITTERID1.value', '')  &#xA;
                     ) &#xA;
                  ) &#xA;
              : ''">

         </custom:SetSubmitterID>
         <type>signature</type>
         <signature>OriginatorSignatureBUTTON_SIGNATURE_1826067747</signature>
         <signer></signer>
         <signformat>application/vnd.xfdl;engine="ClickWrap"</signformat>
         <size>
            <width>40</width>
            <height>1</height>
         </size>
         <signitemrefs>
           <filter>omit</filter>
            <itemref>Page1.ManagerSignatureBUTTON</itemref>
            <itemref>Page1.OfficerSignatureBUTTON</itemref>
            <itemref>Page1.ManagerSignatureBUTTON_SIGNATURE_1678317263</itemref>
            <itemref>Page1.OfficerSignatureBUTTON_SIGNATURE_513701861</itemref>
            <itemref>Wizard_Sales_Person_Info.COMBOBOXSelectPage</itemref>
            <itemref>Wizard_Customer_Info.COMBOBOXSelectPage</itemref>
            <itemref>Wizard_Order_Info.COMBOBOXSelectPage</itemref>
            <itemref>Page1.COMBOBOXSelectPage</itemref>
         </signitemrefs>
         <signinstance>
            <filter>omit</filter>
             <dataref>
               <model></model>
               <ref>instance('ConfigurationInfo')/.</ref>
            </dataref>
            <dataref>
               <model></model>
               <ref>instance('FormOrderData')/.</ref>
            </dataref>
            <dataref>
               <model></model>
               <ref>instance('FormMetaData')/.</ref>
            </dataref>
         </signinstance>
         <signoptions>
            <filter>omit</filter>
            <optiontype>triggeritem</optiontype>
            <optiontype>coordinates</optiontype>
         </signoptions>
      </button>
```

7

Zero Footprint with Webform Server

When deploying Workplace Forms applications, the functionality to enable end users to work with forms is provided through one of two possibilities:

- Using the IBM Workplace Forms Viewer, which is a feature-rich desktop application used to view, fill, sign, submit, and route eForms. The Viewer is able to function on the desktop or within a browser.
- Alternatively, the IBM Workplace Forms Server – Webform Server can be used. You can provide a Zero Footprint solution that allows users to open, complete, and submit forms using a Web browser.

This chapter provides information about the capability of Zero Footprint functionality. (For a complete description of the base scenario, see 5.1, “Introduction to the scenario” on page 174.)

When the solution was built for the original Forms Redbooks with Workplace Forms 2.5, the Webform Server could not be used in the final application since Web services were used for data integration. Webform Server 2.5 does not support Web services.

The solution described in this document uses Web services as well, but because the application can now use XForms with XForms Submit, it is now possible to use a Zero Footprint solution with Web services.

Previously, you were shown how the form is implemented to provide this capability. This chapter provides information about how the Webform Server can be used to provide true Zero Footprint solutions and the considerations required when designing a form-based application.

The following is discussed:

- Webform Server architecture.
- Webform Server 2.5 to 2.6 differences
- Forms design considerations for a Zero Footprint solution

- Working with the Webform Server sample servlets/portlets
- The differences in the user experience when using the Workplace Forms Viewer versus a browser

7.1 Zero Footprint solution

IBM Workplace Forms Server – Webform Server is a Zero Footprint solution that allows users to open, complete, and submit forms using a Web browser. Webform Server is generally the best solution if you need to distribute them to a large user base, such as the general public.

Implementation of the Zero Footprint solution is also an effective way to ensure that the end users cannot have direct access to your data layer. By placing the Websphere Application Server or Portal Server outside the firewall, only the servlet/portlet requiring access to the data is given access to the data inside the firewall. The forms application in the browser has no access to this data except under the control of the servlet/portlet.

In a typical scenario with a Zero Footprint implementation, the user goes to a Web site and clicks a link to request a form. The Webform Server translates that form into a collection of HTML and JavaScript and sends that information to the user's Web browser. The browser displays the translated HTML form to the user, who can then complete the form and submit it back to the server, as shown in Figure 7-1.

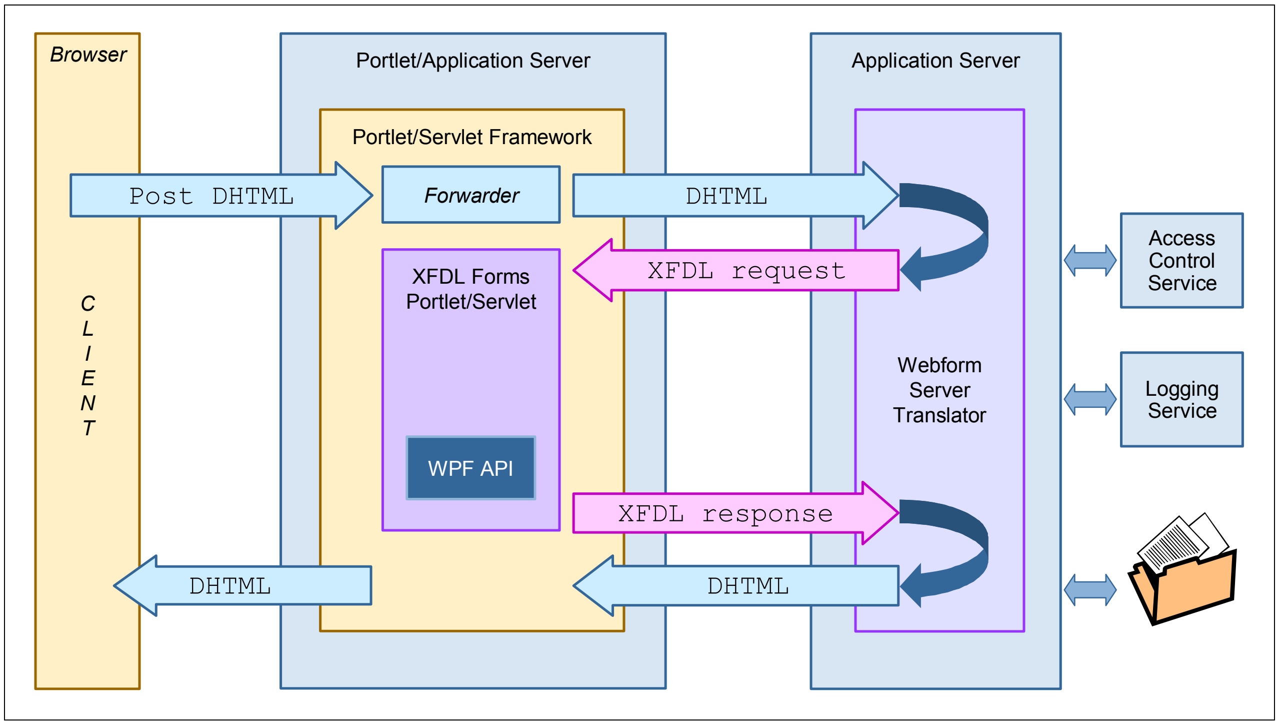


Figure 7-1 The base architecture of the Webform Server

The Webform Server performs the following functions. When the client selects a form to work with, the framework sends a small piece of JavaScript back to the client to determine whether the Viewer is installed. When it is determined that the user does not have the Viewer, the form is sent to the Webform Server Translator so that it can be translated from XFDL to HTML and delivered back to the user. If the Viewer is installed, the XFDL is sent to the client and is rendered in the Viewer.

Whenever the user goes to a new page in the form, the Translator translates the updates from HTML to XFDL and updates the cached forms. It then retrieves the requested page, translates the page back to HTML, and returns the page to the browser.

As you can see in Figure 7-1 on page 449, there are several components involved in the Webform Server architecture. Table 7-1 defines these components.

Table 7-1 Webform Server component definitions

Component	**Description**
Portlet/servlet framework	Controls and handles the communications between the Translator and the servlet/portlet.
XFDL Forms portlet/servlet	The portlet or servlet controls the forms application and processes all incoming and outgoing forms.
Webform Server Translator	The Translator converts forms between XFDL and HTML.
Access Control Service	Provides fail-over support for the system. The Access Locking Service tracks which users are using which form instances, and ensures that in a clustered environment, the user can fail-over successfully. This is also known as Access Control Server. It runs as an OS service.
Logging service	The Log Server logs activity for both the Translator and the portlet/servlet. This runs as an OS service.
Shared file space	This is simply a file area that is used by the Translator to store temporary files. When a form is opened by Webform Server, the original XFDL is stored and maintained in the shared file cache.

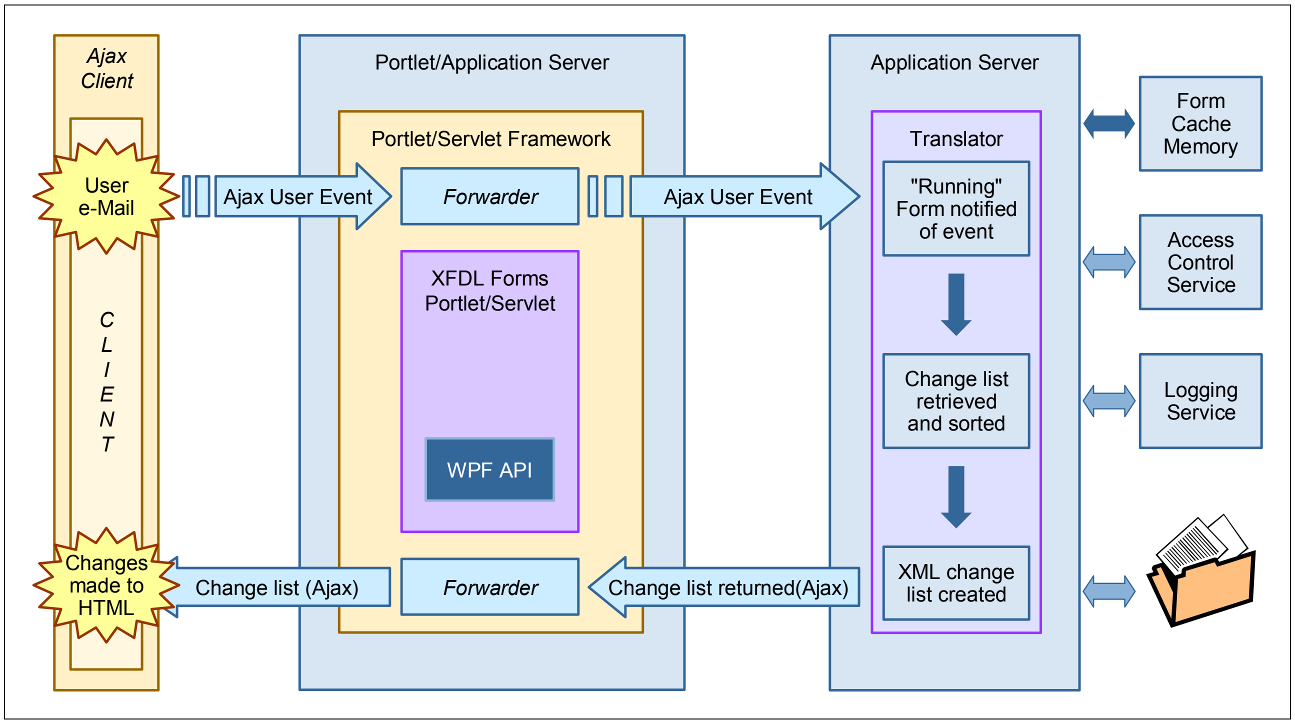


Figure 7-2 Webform Server architecture with Ajax

With Ajax:

1. Ajax recognizes a user event on the client that requires an update, and sends an update request to the forwarder.
2. The forwarder passes the request through the framework and forwards it to the Translator.
3. The Translator replicates the event in the copy of the XFDL form it is running in memory and retrieves the list of changes that need to be made.
4. The Translator then creates a list of XML changes that are required and sends that list back to the forwarder.
5. The forwarder passes the change list through the framework and back to the client.
6. Ajax updates the HTML form as required.

What is Ajax

In order to significantly enhance the Zero Footprint user experience, the use of Ajax has been adopted in Webform Server 2.6. Ajax stands for Asynchronous JavaScript and XML. It is the use of the nonstandard XMLHttpRequest() object to communicate with server-side scripts. It can send, as well as receive, information in a variety of formats, including XML, HTML, and even text files. Ajax's most appealing characteristic, however, is its *asynchronous* nature, which means that it can do all of this without having to refresh the page. This allows you to update portions of a page based upon user events

Ajax is actually implemented using JavaScript. Therefore, JavaScript has to be available in the browser.

The two features in question are that you can:

- ► Make requests to the server without reloading the page.
- ► Parse and work with XML documents.

For more information go to:

http://developers.sun.com/ajax/documentation/

Because of the Ajax implementation, the user no longer has to click the Refresh button to request that the server perform the re-calculations on the form page. This results in a significantly improved user experience.

Zero Footprint considerations

Because Webform Server provides a Zero Footprint solution, not all of the logic in a form can be processed on the client side. While the HTML version of the form that is sent to the user can perform many of the calculations and much of the business logic, there are things it cannot do without help from the server. Because of this, the user's Web browser needs to make calls back to the server when required. These factors mean that the user cannot work with the form offline. Instead, the user must remain connected to the Webform Server to complete the form.

However, users can still save forms to their local computer. When the Save button is clicked, the updated information is returned to the Webform Server and translated to XFDL. The XFDL is returned to the browser and is saved locally on the user's machine as an XDFL document instead of a collection of HTML and JavaScript. This allows users to save work in progress as high-fidelity XFDL for later access. When the XFDL form is opened locally, it is sent to the Webform Server to be translated into HTML and JavaScript and returned to the browser.

Additionally, if a form has to be printed by the browser user, the user clicks the Print button on the Toolbelt. This sends the form to the Webform Server. Then, using the translated XFDL, the Translator converts the form to a graphic (png) file to preserve the fidelity of the form. This ensures that the form is printed with any print logic and look of the XFDL file preserved.

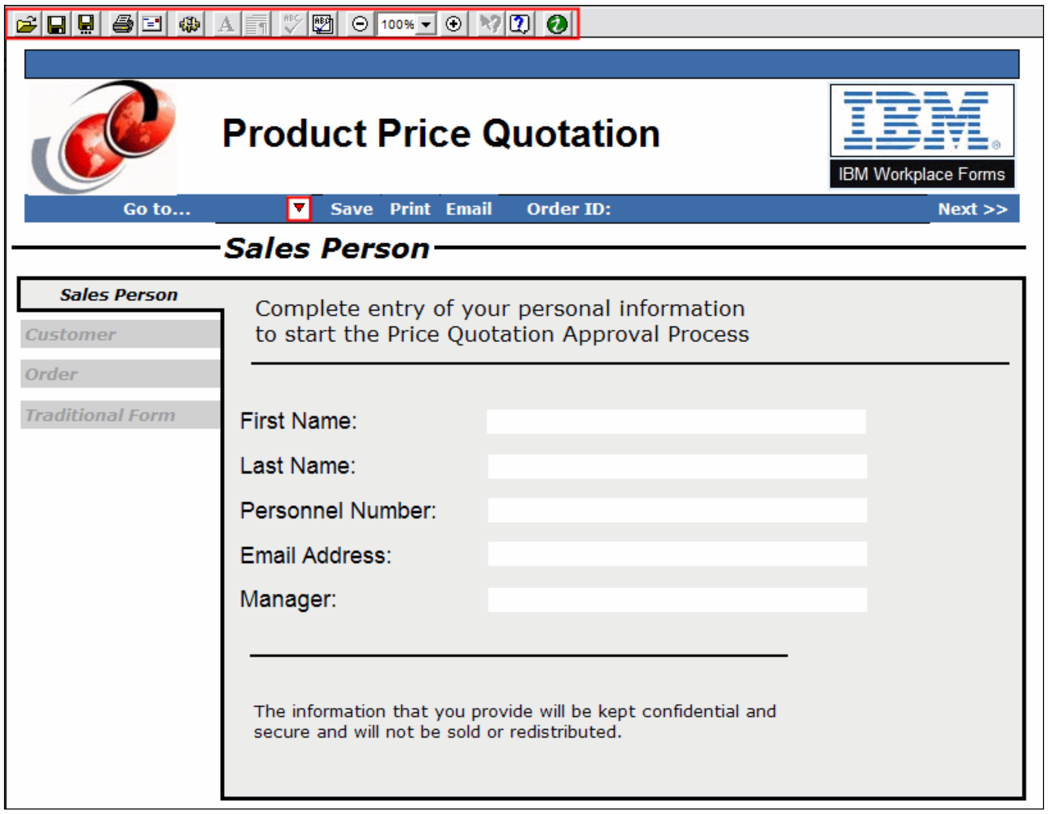
Two of the more compelling reasons to force the use of the Forms Viewer are the extremely limited availability of signature support and client-side Viewer extensions. The Webform Server only supports Click-Wrap signatures. Workplace Forms Viewer extensions (IFXs) are only supported on the server itself (server side).

There is a list of other compatibility concerns in 7.3, “Differences between Webform Server and Workplace Forms Viewer” on page 455.

7.2 Form design delta

The following figures demonstrate the strong similarity between using the Forms Viewer and a browser with the same form.

In Figure 7-3, using the Viewer, the Toolbelt at the top of the form and the Go to wizard graphic are the only two indications that the Viewer is being used.



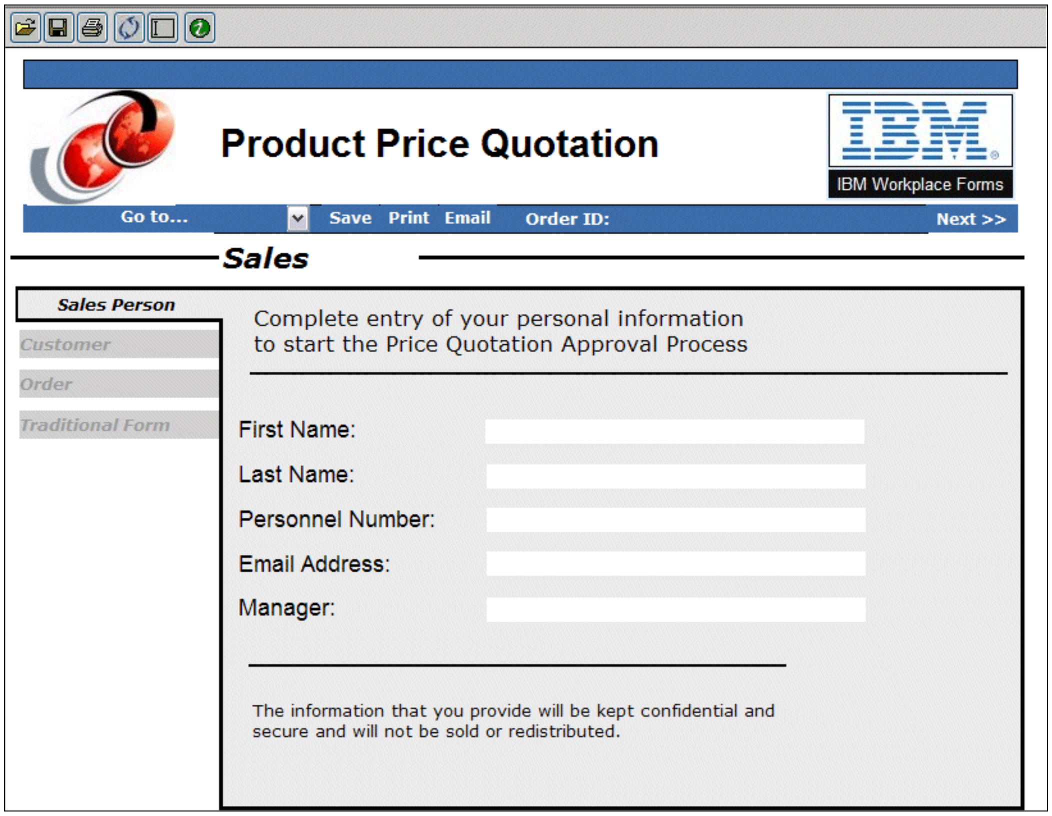
Complete entry of your personal information
to start the Price Quotation Approval Process

First Name:
Last Name:
Personnel Number:
Email Address:
Manager:

The information that you provide will be kept confidential and
secure and will not be sold or redistributed.

Figure 7-3 The price quotation form with the Viewer

With the browser, the functionality available in the Toolbelt is significantly different. Additionally, the Go to wizard graphic is subtly different, as shown in Figure 7-4.


Product Price Quotation

IBM Workplace Forms

Go to... Save Print Email Order ID: Next >>

Sales

Sales Person

Customer

Order

Traditional Form

Complete entry of your personal information
to start the Price Quotation Approval Process

First Name:

Last Name:

Personnel Number:

Email Address:

Manager:

The information that you provide will be kept confidential and
secure and will not be sold or redistributed.

Figure 7-4 The price quotation form with the browser

These and other Toolbelt functions can be changed in the uvf_settings.

Changing the Forms Viewer Toolbelt

The ufv_settings determine what Toolbelt icons are available to the user. The ufv_settings option is declared in either the global form or any page global form. As with other options, the global page settings override the global form settings.

The ufv_settings option belongs to the XFDL namespace. The option can control one or more features. See Example 7-1.

Note: Page settings override the global settings. For example, if you set the validoverlap globally, then set the errorcolor for page one, and then page one does not inherit the validoverlap setting. If you want to add page specific settings to your form, you must repeat the form's global settings in the settings for that particular page.

Example 7-1 Code example of ufv_settings

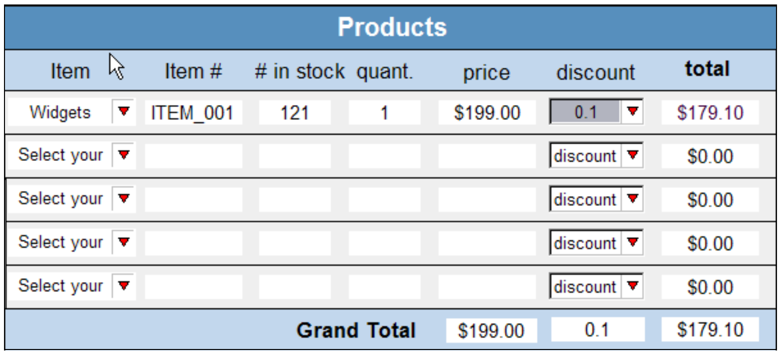
```
<globalpage sid="global">
   <global sid="global">
      <ufv_settings>
         <menu>
            <save>off</save>
            <open>off</open>
         </menu>
      <ufv_settings>
```

```
    </global>
```

The most significant usability differentiator occurs when embedded form calculations exist. The Viewer contains the calculation engine similar to a spreadsheet application. This capability enables instantaneous feedback when a calculation occurs. The browser now has this capability with Ajax. With Forms 2.5, to force the form to perform the calculation, a *Refresh Form* has to be performed so that the Webform Server can perform and re-render the results of the calculations. The following example from the stage 1 implementation describes this process.

Zero Footprint usability improvements

When calculations exist in the form, the Viewer performs the functions immediately. In the Widget line in Figure 7-5, when Widget is selected, item number, number in stock, and price are retrieved and displayed automatically. Additionally, when a value is entered into quant, the total and grand total are immediately calculated and displayed. If a discount is applied, the total and grand total are immediately recalculated and displayed.


Products

Item	Item #	# in stock	quant.	price	discount	total
Widgets	ITEM_001	121	1	$199.00	0.1	$179.10
Select your					discount	$0.00
Select your					discount	$0.00
Select your					discount	$0.00
Select your					discount	$0.00
			Grand Total	$199.00	0.1	$179.10

Figure 7-5 Order entry with the Viewer

With Webform Server 2.5, using the browser results in a much different user experience. As presented in Figure 7-5, when Widget is selected, no associated data is retrieved. Instead, the Item # field, and so on, remains blank. Additionally, when `quantity` is entered, no calculations immediately occurs. In this environment, the user has to click a refresh button to cause a refresh with the Webform Server. By default, the refresh button ( ) on the Toolbelt is used to perform this action.

With Webform Server 2.6 and Ajax, the user experience is the same as the Forms Viewer. The data is retrieved and the calculations occur when the user tabs to a new field. This significantly improved usability.

7.3 Differences between Webform Server and Workplace Forms Viewer

Table 7-2 lists some of the more significant differences between Webform Server and Viewer.

Table 7-2 Differences between Webform Server and Viewer

Functionality	Webform Server	Viewer
Calendar Widget	Not supported.	Supported.
E-mail	Partial support — Users must save forms to their local computer and e-mail them as attachments via e-mail program.	Full support.
Form version support	Version 6.0 and later.	Versions 4.4 and later.
Inactive cells (cells that have their active option set to off)	Internet Explorer - Inactive cells are omitted from lists, comboboxes, and popups. Mozilla-based browsers — Inactive cells are displayed but are disabled.	Inactive cells are displayed but are disabled.
Rich text fields	Not supported. Webform Server converts rich text fields to plain text fields.	Supported.
Schema	XML - Server-side only XForms - Client.	Client and server.
Screen readers	JAWS only.	MSAA compliant.
Slider	Not supported.	Supported.
Smartfill	Not supported.	Supported.
Spell checking	Not supported.	Supported.
User modification of display or print preferences	Not supported.	Supported.
User modification of display or print preferences	Not supported.	Supported.
Viewer functions, such as fileOpen, messageBox, setCursor, and so on	Not supported.	Supported.
Web services	Supported in XForms forms only.	Supported in both XFDL and XForms forms.
Zoom capability	Not supported.	Supported.
URIs starting with file:	Not supported.	Supported.

Forms design considerations

Webform Server allows users to complete and submit forms without the need for any client-side software other than a Web browser. However, in the absence of specialized client-side software, Webform Server cannot support the full-range of functionality that is offered by Workplace Forms Viewer. In many cases, these differences in functionality require a different approach to form design. For instance, forms designed for use with the Viewer may include rich text fields and computes that rely on the keypress or mouseover events. However, since neither of these features is supported by Webform Server, these forms would not work in a Webform Server environment. As a general rule, any form that works with Webform Server also works with the Viewer, but the reverse is not true. If you are designing forms for an environment that uses both Webform Server and the Viewer, be sure to restrict the functionality of the forms to those features that Webform Server supports.

Designing forms for Webform Server

If you are a form designer accustomed to designing forms for the Viewer, it is important that you familiarize yourself with the differences between Webform Server and the Viewer. Some of the differences are simple and have obvious implications, while others are more complex and may require you to adopt different strategies when designing forms. Read the sections below for a quick overview of the primary differences between Webform Server forms and Viewer forms.

Action items

Webform Server supports actions, but with some limitations. Webform Server instructs the browser to automatically refresh a form whenever the user interacts with the form in certain ways. As a side effect of a refresh, actions items that are set to occur once actually occur each time the form is refreshed. Furthermore, actions that are set to repeat do not work properly. Because of this, we recommend extremely limited use of action items.

Appearance of forms

Webform Server draws all forms using standard HTML widgets when drawing check boxes, radio buttons, popups, and comboboxes. This may produce a slightly different look when compared to forms displayed in the Viewer. However, this does not change the functionality of the form. We recommend that you test your form in the Viewer and with Webform Server (on all platforms that the form will be viewed on).

Attachments

Webform Server allows users to attach files to a form in the normal manner. However, users can only attach one file at a time. The attachment dialog does not allow users to multi-select files. This may dictate slightly different form design, since requiring a large number of attachments can be cumbersome for the user.

Computing URLs

Webform Server assumes that forms are always submitted to the server that is running Webform Server. If forms are submitted to other servers, Webform Server is not able to intercept the form and translate it back into XFDL. For this reason, you must make sure that all computed URLs submit the form to the Webform Server. If you are using Webform Server with portal, do not use computed URLs.

Dates

While the Viewer allows you to configure your calendar date preferences. Webform Server does not. Webform Server always interprets ambiguous dates as year, month, day. For example, 01/02/03 would be February 3rd, 2001.

e-Mailing forms

Webform Server does not allow users to e-mail forms. This means that there is no toolbar control for mailing forms, and that buttons configured with an e-mail URL do not work. If you need your users to e-mail forms to each other, they must save the forms locally and send them as attachments to regular e-mails. See *IBM Workplace Forms Server — Webform Server Administrator's Guide* for more details.

Event model

Computes based on the activated, dirtyflag, keypress, and mouseover options do not work under Webform Server. Computes based on the focused and focuseditem options work under Webform Server if the correct settings are modified in the translator.properties file. For detailed information about the translator.properties file, see the *IBM Workplace Forms Server - Webform Server Administrator's Guide.*

IFX files

Webform Server supports IFX files on the server. That is, your form can reference an IFX file that resides on the server. Webform Server does not support IFX files on the user's computer (client) or IFX files embedded in a form.

Lists

If a form contains a list (the XFDL list item), and the text within the list is wider than the list box, a horizontal scroll bar is displayed within the list box when the form is viewed in the Viewer. If the form is viewed via Webform Server, the list box does not contain a horizontal scroll bar. Any text that does not fit within the list box is truncated.

Locales

Webform Server cannot remotely set the user's locale. The locale viewed by the user is determined by the user's browser, not the form. Furthermore, if you are using the Viewer with a Webform Server application (for example, using Webform Server to deliver XFDL forms embedded within HTML pages for users that have the Viewer installed on their system), the locale of the Viewer may not be the same as the locale of the form. Webform Server cannot specify the locale of the Viewer. The Viewer's locale is always determined based on the Viewer preferences. The default locale is the locale of the operating system.

Navigating forms

The up and down arrow keys do not open popups. Instead, use Alt+up arrow and Alt+down arrow. Once a popup is open you can still use the normal arrow keys to move among the selections. You should also note that pressing the Esc key to leave a popup or combobox does not cancel the last choice the user made before leaving the widget. Although this is the default HTML form response to the ESC key, it is not the default Workplace Forms Viewer response. Users accustomed to using the Viewer will be unfamiliar with this result.

When working in a multi-line field, the following cursor keys produce different results than in the Viewer:

- PgUp scrolls the text up one page.
- PgDn scrolls the text down one page.
- Ctrl+PgUp moves the cursor to the beginning of the visible text.
- Ctrl+PgDn moves the cursor to the end of the visible text.

Printing

When a user prints a form through Webform Server, the server responds with a print preview that opens in a new window. The user can either print the form from the preview or close the preview and return to the original form.

The preview is a PNG image of the form that is generated on the server. This image is generated to a size that is determined by the server configuration. This means that the image is always generated to fit a specific page size, which in turn means that the page size cannot be changed from form to form or page to page.

Because the PNG image is generated on the server, any fonts used by the form must also reside on the server in order for the form to print correctly. In other words, when designing forms that users may print, make sure that you use fonts that you can make available on the server.

Signatures

Webform Server allows users to sign forms using Clickwrap signatures, and to verify other types of signatures that have already been applied to the form. However, Webform Server does not allow users to sign forms using any other signature types.

This means that signature-based security is limited when using the Webform Server. While Clickwrap signatures prove acceptance of a document, they do not provide the same level of authentication as digital signatures.

Instead, the job of properly identifying the user is moved to the Web application, which may use standard authentication measures for logging in users before they work with forms.

Type checking and predictive input checking

Webform Server does not support predictive input checking. However, Webform Server does support type checking when the user exits a field.

For instance, if a field is set to accept phone numbers in the ###-#### format, the user is able to enter any initial value into that field. However, once they shift focus to another item, the field is highlighted as an error if the value does not match the template.

Note: Changing the default settings in the Webform Server translator.properties file (for example, setting changeNotificationItems to none) may result in type checking not working as described above. For detailed information about the translator.properties file, see the *IBM Workplace Forms Server — Webform Server Administrator's Guide*.

URLs

Webform Server does not allow users to submit forms to multiple URLs at the same time. Submissions are restricted to a single URL because of potential difficulties when updating the original XFDL form. When Webform Server sends a form to the user, it keeps the original XFDL form on hand.

When the HTML form is later submitted, Webform Server updates the XFDL form with the submitted data. However, if two sets of data are submitted, as they would be if you were submitting to two URLs, Webform Server would have difficulty synching both data sets with the original XFDL form. For this reason, multiple URLs are not supported.

Note: XFDL 7.0 does not support submissions to multiple URLs. Only older versions of XFDL support submissions to multiple URLs. In other words, you cannot set up an XFDL 7.0 form so that the Viewer submits it to multiple URLs.

Viewer settings

While the Viewer supports a number of specialized settings through the ufv_settings option, Webform Server ignores all Viewer settings except for the menu, printwithformaterrors, savewithformaterrors, signwithformaterrors, and submitwithformaterrors settings.

Of those settings, all of them work exactly as they do in the Viewer, with the exception of the menu setting. This setting supports the toolbar buttons that are specific to Webform Server. Table 7-3 lists those buttons and provides the appropriate tag for each.

Table 7-3 Toolbar buttons for Webform Server

Icon	Description	Tag
Open	Opens a new form	open
Save	Saves the current form	save
Print	Prints the current form	print
Refresh	Refreshes the current page	refresh
Accessibility	Toggles accessibility mode on and off	accessibility

XForms

When creating a form using XForms, the XForms elements are enclosed or skinned within XFDL elements. As a result, Webform Server's support of XForms is based on Webform Server's support of the associated XFDL items and options. See the XFDL Specification for details on how XForms elements are skinned by XFDL elements.

XForms submissions

Webform Server ignores URLs for submissions of type replace=all. In the Viewer, submitting to a URL submits the data to the URL. For example, you can submit data to another application, like a database, using a URL. With Webform Server, submitting to a URL submits the data to the (Webform Server) servlet. This means that if you want to submit data (using replace=all) to another application, you cannot use only a URL submit. You must also retrieve the information from the servlet and direct it to the desired application.

Note: To create a submission of type replace=all (the default setting), you must create it within a DOMActivate event.

XML Data Model

By default, the XML Data Model is updated while the user is filling out the form. However, changing the default settings in the Webform Server translator.properties file (for example, setting changeNotificationItems to none) may result in the XML Data Model not being updated while the user is filling out the form. If so, the user must click an Update button to update all computes in the form, including the XML Data Model. For detailed information about the translator.properties file, see the *IBM Workplace Forms Server — Webform Server Administrator's Guide*.

7.4 Web services with Workplace Forms 2.6 solution

The Workplace Forms 2.5 Redbooks solution could not include Zero Footprint because Web services is not supported in Webform Server 2.5. This is resolved in Workplace Forms 2.6 because server-side Web services calls can be implemented using XForms submission.

XForms submissions

In general, on submission, the data goes to the Webform Server. The data is then redirected to the correct URL automatically.

In the Viewer, submitting to a URL submits the data to the URL. For example, you can submit data to another application, like a database, using a URL. With Webform Server, submitting to a URL submits the data to the Webform Server servlet.

If you want to submit data (using replace=all) to another application, you cannot use only a URL submit. You must retrieve the required information using the servlet and direct it to the desired application from the servlet using the correct URL.

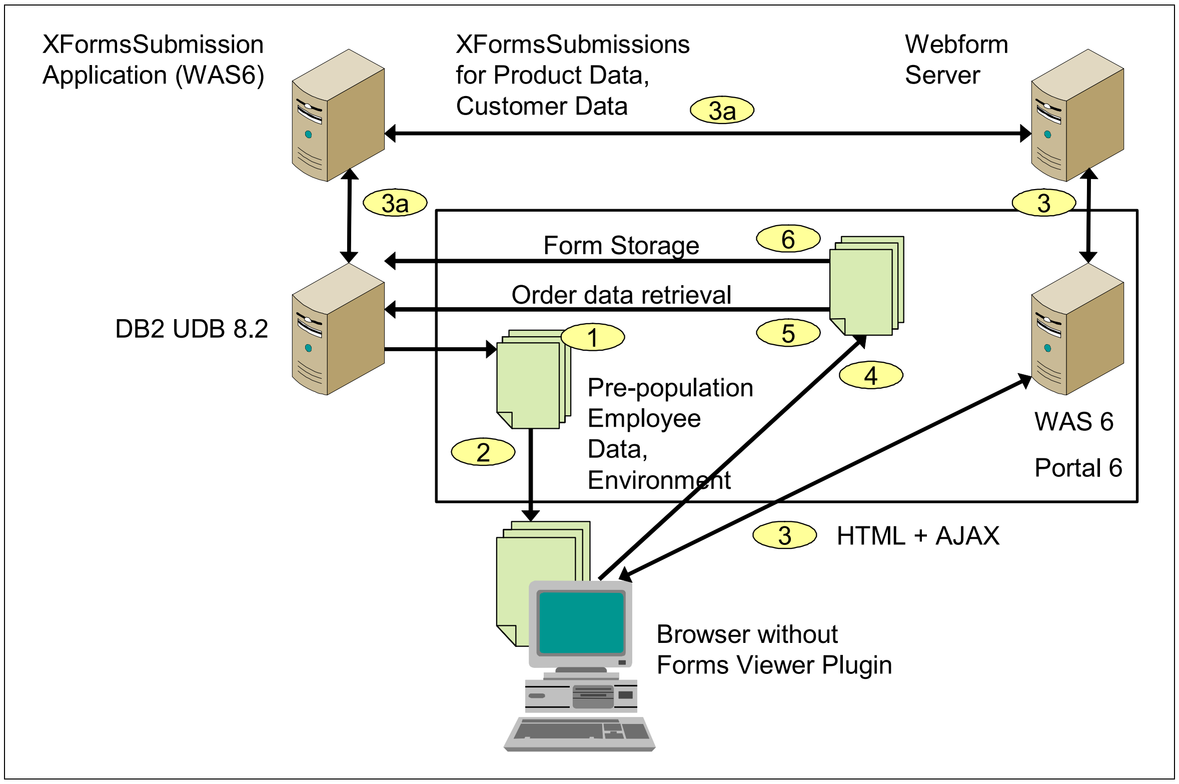

XFormsSubmission Application (WAS6)
XFormsSubmissions for Product Data, Customer Data
3a
Webform Server
3a
3
Form Storage
6
Order data retrieval
5
DB2 UDB 8.2
1
Pre-population Employee Data, Environment
4
2
WAS 6
Portal 6
3
HTML + AJAX
Browser without Forms Viewer Plugin

Figure 7-6 Application with Webform Server

Based on the information in Figure 7-6, the Zero Footprint forms application works in the following manner:

1. A request for a form is made from the modified list sample jsp.
2. A servlet obtains information from DB2 to pre-populate the form. The form is passed to the Webform Server to determine whether the client has a browser installed. (There is a line of code in the Redbooks jsp that forces HTML translation.) The form is translated to HTML by the Webform Server Translator and is sent to the browser.
3. Working in the form, at any state change an AJAX call is sent through the servlet to the Webform Server. On page flip, a new HTML page is rendered and sent to the browser. (3a): In case of called XForms submissions for data gathering, the AJAX call starts an XForms submission on the Webform Server requiring the requested data from the XForms submission handling application on WAS6. This application retrieves the data from the DB2 database and sends it back to the Webform Server. The server updates the internal node structure according the received information and submits any changes back to the browser using AJAX.
4. Selecting a Done button in the HTML page, the Webform Server returns the completed XFDL form to the application servlet.
5. The servlet extracts data from the XFDL file and stores it to the DB2 database.

6. The servlet stores the complete XFDL file to the database.
7. The servlet sends a success page back to the browser. (This step is not visible in Figure 7-6 on page 460.)

In the application that has been built for the Redbooks solution, there are changes that had to be made. The first is in the navigation that allows the user navigation to the appropriate set of JSPs (Welcome page, Template lists, submission lists, and others). This is two lines of code change that provide access to the JSPs that are enhanced to support the Zero Footprint solution as well as the Viewer solution.

Servlet code changes are also made to enable the jsp to work in a Zero Footprint environment. Example 7-2 provides code snippets that are necessary for this to work.

Example 7-2 New import for the Forms Server framework

```
//=======================================================================================
new imports
WFServer:
import com.ibm.form.webform.framework.servlet.IBMWorkplaceFormsServerServlet;
import com.ibm.form.webform.framework.servlet.WebformServletResponse;

//=======================================================================================



//=======================================================================================
Stage2:
public class SubmissionServlet extends HttpServlet {
WFServer:
 // WF Server - New class definition begin ==============
 // we extend now IBMWorkplaceFormsServerServlet class
public class SubmissionServletWF extends IBMWorkplaceFormsServerServlet {
 // WF Server - New class definition begin ==============

//=======================================================================================

.
.
Code to initialize the new class.


WFServer:
       // WF Server - new class initiation begin ==============
       // IBMWorkplaceFormsServerServlet cannnot initiate with ServletConfig as parameter
       //public void init(ServletConfig config) throws ServletException {
       public void init() throws ServletException {
               super.init();
               conf = super.getServletConfig();

               System.out.println("SubmissionServletWF: init(): started");
               //Initialize the Workplace Forms API
```

Next we add code, as shown in Example 7-3, to ensure that the Webform Server Translator is forced to send HTML to the client. This is done for testing ease.

Example 7-3 Code to force HTML

```
begin ==================
      String mode = request.getParameter("mode");
      //for easy test setup - we assume, we will always work with Zero Footprint
in webformserver scenario
      //remove this line, if you really will detect plugin inatallation
      this.useHTML(response, true);
      // for WF Server == determine the rendering mode parameter from url end
==================
```

Additionally, a process has to be used to retain user attributes like user ID, department, and so on. To accomplish this, we store the attributes in the session and not in the request. We have to do this in several locations in the code, as shown in Example 7-4.

Example 7-4 Store attribute data

```
multiple changes like this to store any attributes in the session, not in the 
request:
Stage2:
      request.setAttribute("userRole", userID);
WFServer:

      request.setAttribute("userRole", userID);
      //for WF-Server, we will store all user dependent settings in the session 
attributes
      request.getSession().setAttribute("userRole", userID);
```

The rest of the application is no different from the code used in the Viewer solution. The code can be downloaded as described in Appendix D, “Additional material” on page 693.

7.5 The sample applications

The Webform Server installation includes servlet samples and portlet samples that you can deploy to your application server or portal server. These samples are designed to demonstrate a simple forms-based application, and include source code that you can review.

The samples

Both samples present a simple interface that allows you to view the contents of a particular directory on your computer. The sample lists the forms in that directory, and allows you to view any form you select, and submits any form you view. The servlet accomplishes this by first presenting a view of the directory. When you select a form, the form replaces the directory in the browser. When the user submits the form, the directory is again displayed. The portlet sample accomplishes this by using two portlets. The first portlet displays a list of the forms in the directory, while the second portlet displays the selected form. In both samples, users can navigate to a sub-directory that stores submitted forms, and can review the sample code and forms as they like. Particular areas that may be of interest include how globalization was accomplished in the portlet and servlet and how XForms submissions of type __replace=’all’__ is handled in the XForms sample form.

Setting up the sample servlet

There are two different procedures for setting up the sample servlet, depending on whether you want to run the servlet on the same server as the Translator, or whether you want to run it on a different application server.

Running the sample servlet on the Translator server

The sample servlet is installed with Webform Server, and automatically runs on the Translator server if you accepted all of the default settings during the installation process.

Deploying the sample servlet on a different application server

The sample servlet is set up to be run on the same server as the Translator. If you want to run it on a different server, you must:

1. Modify the sample servlet.
2. Deploy the updated WAR file to your application server.
3. Set up the API to work with your application server.

Modifying the sample servlet

Before you can modify the sample servlet, you must ensure that you have a version of the Java Development Kit installed on your computer. This is used to update the WAR file once you have made changes to the servlet. To modify the sample servlet:

1. Locate the following file:

   ```
   <Webform Server Install Dir>/Samples/Servlet/SampleSrc.zip
   ```

2. Unzip the file.
3. In the unzipped directory, locate the following file:

   ```
   WEB-INF/web.xml
   ```

4. Open the file in a text editor and update the following init-params:
   - translatorLocation
   - logServerName
   - logServerPort

   For more information about these parameters, see “Configuring a Servlet” in the Webform Server Administration Manual.

5. Save your changes.
6. Run the createWAR.bat file in the root of the unzipped directory. This creates a new WAR file called Sample.war that contains the sample servlet.

Deploying the sample servlet

To deploy the sample servlet you must install the WAR file that you just created on your application server. For more information about installing a WAR file, refer to the documentation for the application server you are using.

Setting up the API

This process varies depending on the application server you are using.

Using the sample servlet

The sample servlet provides a simple interface for working with forms on a server. Using this application you can:

- Open a blank form in XFDL or HTML.
- Submit a completed form.
- Open a previously submitted form in XFDL or HTML.

The following sections explain the functionality of the servlet.

Starting the servlet

To start the sample servlet, open a browser and go to the following URL:

```
http://<server name>:<port>/Samples
```

(The default is `http://localhost:8085/Samples`.)

Note: You must supply the name of the server that is running the sample servlet, as well as the appropriate port number.

This loads a welcome page that gives you the option of running the servlet or reviewing the source code used to create it. Once you run the sample, the servlet loads a directory listing of sample forms and displays a list of all of the forms available.

Opening a template form

Once the sample is running, you see a directory listing that includes all template forms available to the application. The directory listing provides three ways to open a form:

- Force XFDL — Clicking the Force XFDL icon opens the form as an XFDL document. You must have the Viewer installed to view the document in this manner.
- Force HTML — Clicking the Force HTML icon opens the form as an HTML document, which is displayed in your Web browser.
- Click the link — Clicking the link to the form causes the sample application to automatically detect whether you have the Viewer installed. If you do, the form opens as XFDL. Otherwise, the form opens as HTML.

While the sample only includes one template form, you can add further forms to the sample by copying forms to the following directory:

```
<Servlet Deployment Dir>\ServletSampleForms
```

Submitting a form

When you submit a form to the sample, the form portlet writes your forms to a submissions folder within the forms directory.

Opening a submitted form

Once you have submitted one or more forms to the sample, the servlet includes a submissions sub-directory in its listing of the available forms. To open a form you have already submitted, simply navigate to this directory (by clicking it) and select the form you want to open. As with the template forms, you can open previously submitted forms as either XFDL or HTML.

Deleting a submitted form

To delete a form that you have already submitted, you must manually delete the form from the form submissions directory. For example, under Tomcat this directory is:

```
<Servlet Deployment Dir>\ServletSampleForms\submissions
```

Setting up the portlet sample

There are two different procedures for setting up the portlet sample, depending on whether you want to run the portlets on the same server as the Translator, or whether you want to run them on a separate portal server.

Running the portlet sample on the Translator server's server

The portlet sample is included with Webform Server as a WAR file that contains two portlets. This sample assumes that you are running the Translator server on the same server as the portlet sample, so does not need to be modified. However, before you use the sample, you must install it in your portal server:

1. Locate the WebformSamplePortlet.WAR file in the following directory:

   ```
   <Webform Server Installation Dir>/Samples/Portlet/
   ```

2. Install the WAR file into your portal server. Consult the documentation for your portal software to determine how to do this.
3. Create a page that uses the following portlets:
   - IBM Workplace Forms Server - Webform Server List Sample. This portlet displays a list of the available forms.
   - IBM Workplace Forms Server - Webform Server View Sample. This portlet displays the form selected by the user.

Once you have created a page with the portlets, you can access that page and use the sample.

Deploying the portlet sample on a separate portal server

The portlet sample is set up to be run on the same server as the Translator. If you want to run it on a different server, you must:

- Modify the portlet sample.
- Deploy the updated WAR file to your portal server.
- Set up the API to work with your portal server.

Modifying the portlet sample

To modify the portlet sample:

1. Locate the following file:

   ```
   <Webform Server Install Dir>/Samples/Portlet/WebformPortletSampleSrc.zip
   ```

2. Unzip the file.
3. In the unzipped directory, locate the following WEB-INF/portlet.xml file.
4. Open the file in a text editor and update the following init-params:
   - translatorLocation
   - logServerName
   - logServerPort
5. Save your changes.
6. In the unzipped directory, locate the following WEB-INF/web.xml file.
7. Open the file in a text editor and update the following init-params:
   - TranslatorLocation
   - LogServerName
8. Save your changes.
9. Run the createWAR.bat file in the root of the unzipped directory. This creates a new WAR file called WebformSamplePortlet.war that contains the portlet sample.

Deploying the portlet sample

To deploy the portlet sample:

1. Ensure that the WebformSamplePortlet.WAR file is available to your portal server. You may need to copy the file to the server that is running your portal server.
2. Install the WAR file into your portal server. Consult the documentation for your portal software to determine how to do this.
3. Create a page that uses the following portlets:
   - Webform Server Forms List Sample — This portlet displays a list of the available forms.
   - Webform Server Form Viewer Sample — This portlet displays the form selected by the user.

Setting up the API

This process varies depending on the application server you are using.

Using the portlet sample

The portlet provides a simple interface for working with forms on a server. Using this application, you can:

- Open a blank form in XFDL or HTML.
- Submit a completed form.
- Open a previously submitted form in XFDL or HTML. The following sections explain the functionality of the portlet.

Starting the portlet sample

To start the portlet sample, open the appropriate page in your portal. One portlet displays a list of the available forms, while the other portlet contains nothing.

Opening a template form

Once the sample is running, you see a directory listing that includes all template forms available to the application. The directory listing provides three ways to open a form:

- Force XFDL — Clicking the Force XFDL icon opens the form as an XFDL document. You must have the Viewer installed to view the document in this manner.
- Force HTML — Clicking the Force HTML icon opens the form as an HTML document, which will be displayed in your Web browser.
- Click the link — Clicking the link to the form causes the sample application to automatically detect whether you have the Viewer installed. If you do, the form opens as XFDL. Otherwise, the form opens as HTML.

While the sample only includes one template form, you can add further forms to the sample by copying forms to the following directory:

```
<Portlet Deployment Dir>\SampleForms
```

Submitting a form

When you submit a form to the sample, the form portlet writes your forms to a submissions folder within the forms directory.

Opening a submitted form

Once you have submitted one or more forms to the sample, the list portlet includes a submissions sub-directory in its listing of the available forms.

To open a form you have already submitted, simply navigate to this directory (by clicking it) and select the form you want to open. As with the template forms, you can open previously submitted forms as either XFDL or HTML.

Deleting a submitted form

To delete a form you have already submitted:

1. In the list portlet, navigate to the submissions directory.
2. To the right of the file you want to delete, click **X**.

Note: The forms stored in this directory may be automatically deleted when you restart the portlet.

7.6 Servlet/portlet required

In this section we discuss the servlet/portlet required.

Creating a servlet

If you want to implement your application as a servlet, you must create a special servlet that communicates with the Webform Server. This servlet represents your overall application, and routes forms between the user and the Translator when necessary.

The servlet can include any functionality you want. For example, you might create a servlet that not only uses the Translator to provide HTML forms to the user, but that also routes completed forms to the next step in their life cycle.

To create this servlet, you must extend the IBMWorkplaceFormsServerServlet class that is provided with Webform Server. This class also provides a number of methods that simplify the process of implementing your servlet.

Normal servlet operations

Normal operation of the Webform Server assumes that there are two form-related actions the user might take:

- The user requests a form from the servlet. This is generally a standard GET action that is triggered by clicking a link on a Web page.
- The user submits a completed form to the servlet through a POST action. This may be either an XFDL form or a form that was previously translated into HTML.

In either case, the request is processed through a combination of functionality that is provided by the IBMWorkplaceFormsServerServlet class and code that you write while extending the servlet. Furthermore, the IBMWorkplaceFormsServerServlet class is designed to ignore requests that do not involve XFDL forms. This means that all other operations fall through the framework to your custom code.

In general, you must implement a doGet and a doPost method within your servlet to handle the expected form-related scenarios.

Creating a portlet

If you want to implement your application within a portal, you must create one or more portlets that communicate with Webform Server. These portlets represent your overall application, and route forms between the user and the Translator when necessary.

The portlets can include any functionality that you want. For example, you might create a portlet that not only uses the Translator to provide HTML forms to the user, but that also routes completed forms to the next step in their life cycle.

To create this portlet, you must extend the IBMWorkplaceFormsServerPortlet class that is provided with Webform Server. This class is based on the JSR 168 portlet standard, and also provides a number of methods that simplify the process of implementing your portlet.

Note: If you are using XFDL forms in a portlet, your users must have Workplace Forms Viewer 2.5 or later, or a PureEdge-branded Viewer of at least Version 6.2. portlets will not work with earlier versions of the Viewer.

Normal portlet operations

Normal operation of a portlet with Webform Server assumes that there are two form-related actions the user might take:

- The user requests a form from the portlet. This is generally done by clicking an action link in the portlet.
- The user submits a form that is being displayed by the portlet. This may be either an XFDL form or a form that was previously translated into HTML.

In either case, the request is processed through a combination of functionality that is provided by the IBMWorkplaceFormsServerPortlet class and code that you write while extending the portlet. Furthermore, the IBMWorkplaceFormsServerPortlet class is designed to ignore requests that do not involve XFDL forms. This means that all other operations will fall through the IBMWorkplaceFormsServerPortlet to your custom code.

In general, you must implement a processActionEx and a doViewEx method within your portlet to handle the expected form-related scenario.

7.7 Solving a common Webform Server upgrade problem

Upgrading from Webform Server 2.5 to 2.6 presents unusual challenges since the Webform Server now runs as a servlet on WebSphere Application Server. The following is a list of steps that may help you resolve some of the challenges of getting the portlet samples working correctly after this upgrade.

Configure WebSphere Portal to access the Forms API

To do this:

1. Start server1 (WAS) so that you can access the WAS admin console.
2. Open a browser and use http://hostname:9090/admin to access the WAS Admin Console.
3. Set the WebSphere variables. In the console, expand **Environment** and choose **Manage WebSphere Variables**.
4. Change the server scope to WebSphere_Portal by clicking the **Browse Servers** button, selecting **WebSphere_Portal**, and clicking **OK**, and then click **Apply** → **Save** → **Save** (not necessary here).

5. Use the New button to create a new variable. Set the name of the variable to `WFS_API_DIR` and the value of the variable to the location of the APIs (for example, C:\IBM\WorkplaceForms\Server\2.6\API\redist\msc32). Click **Apply** → **Save** → **Save**.
6. Create another environment variable called `WFS_API_LIB_DIR`, and set the value to `${WFS_API_DIR}/PureEdge/70/java/classes`. Then click **Apply** → **Save** → **Save**.
7. Set the Java process definitions. Open **Servers** → **Application Servers** → **WebSphere_Portal** → **Process Definition** → **Environment Entries**.
8. Add the following entries to the PATH property:

   ```
   ;${WFS_API_DIR};${WFS_API_DIR}/PureEdge/70/system
   ```

   Then click **Apply** → **Save** → **Save**. Removed the period (.) from 7.0.
9. Set up the shared libraries. Choose **Environment** → **Shared Libraries**. If populated, clear the server field and click **Apply**.
10. If it exists, remove the old shared library. Check **PureEdgeLib** and click the **Delete** button. Click **Save** → **Save**.
11. Click **New** to create a new shared library. Give it the name `WFS_API_LIB`. Under classpath, provide the following (one per line):
    - {WFS_API_LIB_DIR}/pe_api.jar
    - {WFS_API_LIB_DIR}/pe_api_native.jar
    - {WFS_API_LIB_DIR}/uwi_api.jar
    - {WFS_API_LIB_DIR}/uwi_api_native.jar
12. Click **Apply** → **Save** → **Save**.
13. Set the server class loader. Open **Servers** → **Application Servers** → **WebSphere_Portal** → **Classloader**.
14. Select the classloader listed and click **Libraries**.
15. Remove PureEdgeLib from the list by checking it and clicking **Remove**.
16. Click **Add** and select **WFS_API_LIB**.
17. Click **Apply** → **Save** → **Save**.
18. The WAS server may now be stopped.

Configure the portlets

To do this:

1. Start the portal server (**Start** → **Programs** → **IBM WebSphere** → **Portal Server v5.1** → **Start the Server**. You may want to add this shortcut to your desktop.)
2. When is it started, access portal with the URL http://forms.ibm.com:9081/wps/portal. Log in as `wpsadmin` with password `passw0rd`.
3. Click the **Administration** link.
4. Go to **Portlet Management** → **Web Modules**.
5. Search for `PEPortletSample.war` and click the trash can icon to uninstall the old version of the portlets. Confirm the deletion.
6. Click the **Install** button and browse to C:\WebformServer\samples\portlet\WebformPortletSample.war.
7. Click **Next**. This will list WebformReleaseSample as the portlet application, and Form List Sample portlet and Form View Sample portlet as the portlets. Click **Finish**.
8. Go to **Portal User Interface** → **Manage Pages**.

9. Click the **My Portal** page.
10. Click the pencil icon beside the Workplace Forms page. This page is now empty, since we deleted the old portlets.
11. Set the page to single column, and click **Add Portlets**. Search for portlets that begin with `Form`.
12. Select **FormListSample** and **FormViewSample** to the page and click **OK**, then click **Done**.
13. Use the **My Portal** link at the top right to go back, and click the **Workplace Forms** page. The list portlet should list one form, and clicking it should open in the Viewer or browser.

Note: To add additional forms to the list displayed in the List portlet, store the XFDL files in C:\WebSphere\PortalServer\installedApps\WebformSamplePortlets_PA_1_0_IP.ear\PA_1_0_IP.war\SampleForms.

8

Integration with IBM DB2 Content Manager

This chapter describes the integration of IBM Workplace Forms with DB2 Content Manager. The automation of forms is often a critical requirement in many Content Manager (CM) installations cross-industry. IBM Workplace Forms can be easily integrated with Content Manager and thereby delivers a high level of synergy.

To remain within the context of the sample scenario application described throughout this book, we consider that the Content Manager can ultimately serve as the final repository for signed forms.

We provide detailed information about how to integrate Workplace Forms with CM to expand record management capabilities and build complex workflows for development of document-centric applications. When integrating IBM Workplace Forms with CM, you create security-rich front-end transaction records with a streamlined, secure content management infrastructure.

Note: The code used for building this sample scenario application is available for download. For specific information about how to download the sample code, refer to Appendix D, “Additional material” on page 693.

Note: All specific examples shown and used when building the sample scenario application are based on the codebase for IBM Workplace Forms Release 2.6.

8.1 Overview

Workplace Forms can be stored in Content Manager as items with specific attribute arrays that in turn can be used to store metadata describing the form. Content Manager can serve as a central repository with different purposes and functionalities in regard to eForms:

- Document management
- Workflow modelling and processing
- Data search and retrieval
- Archive and storage

Figure 8-1 gives you a functional overview of the three tiers involved when integrating DB2 Content Manager.

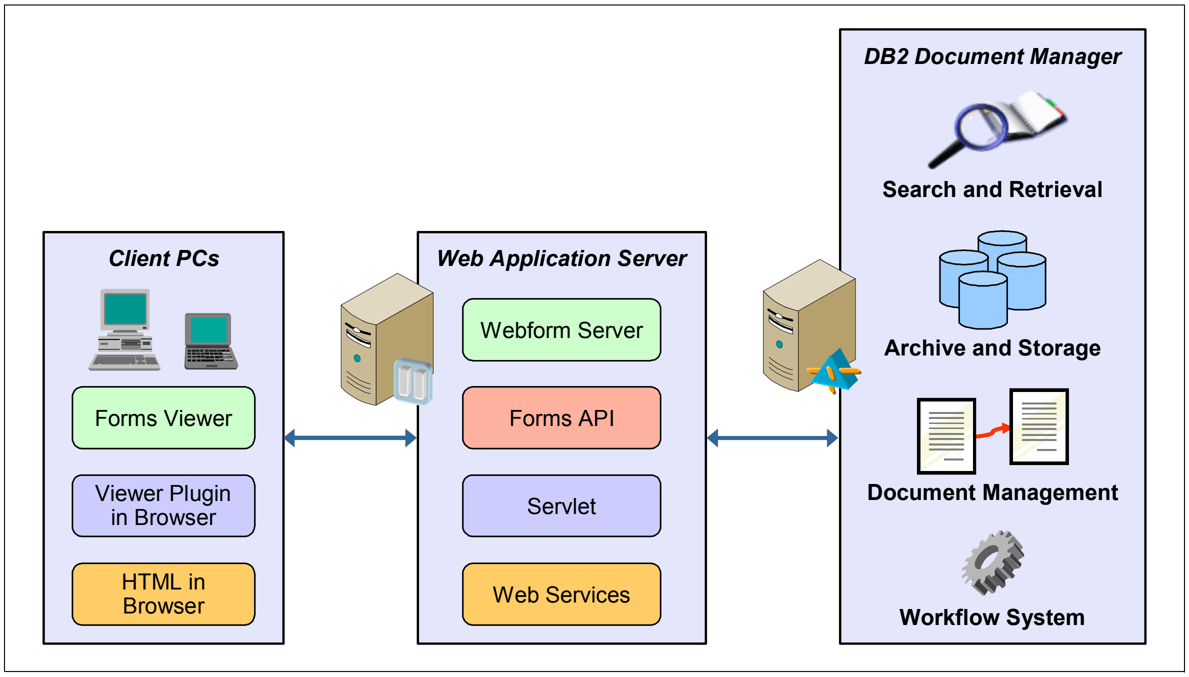


Figure 8-1 Three-tier overview of DB2 Content Manager integration

The interaction of Workplace Forms with DB2 Content Manager usually follows a specific sequence of steps, as shown in Figure 7-2.

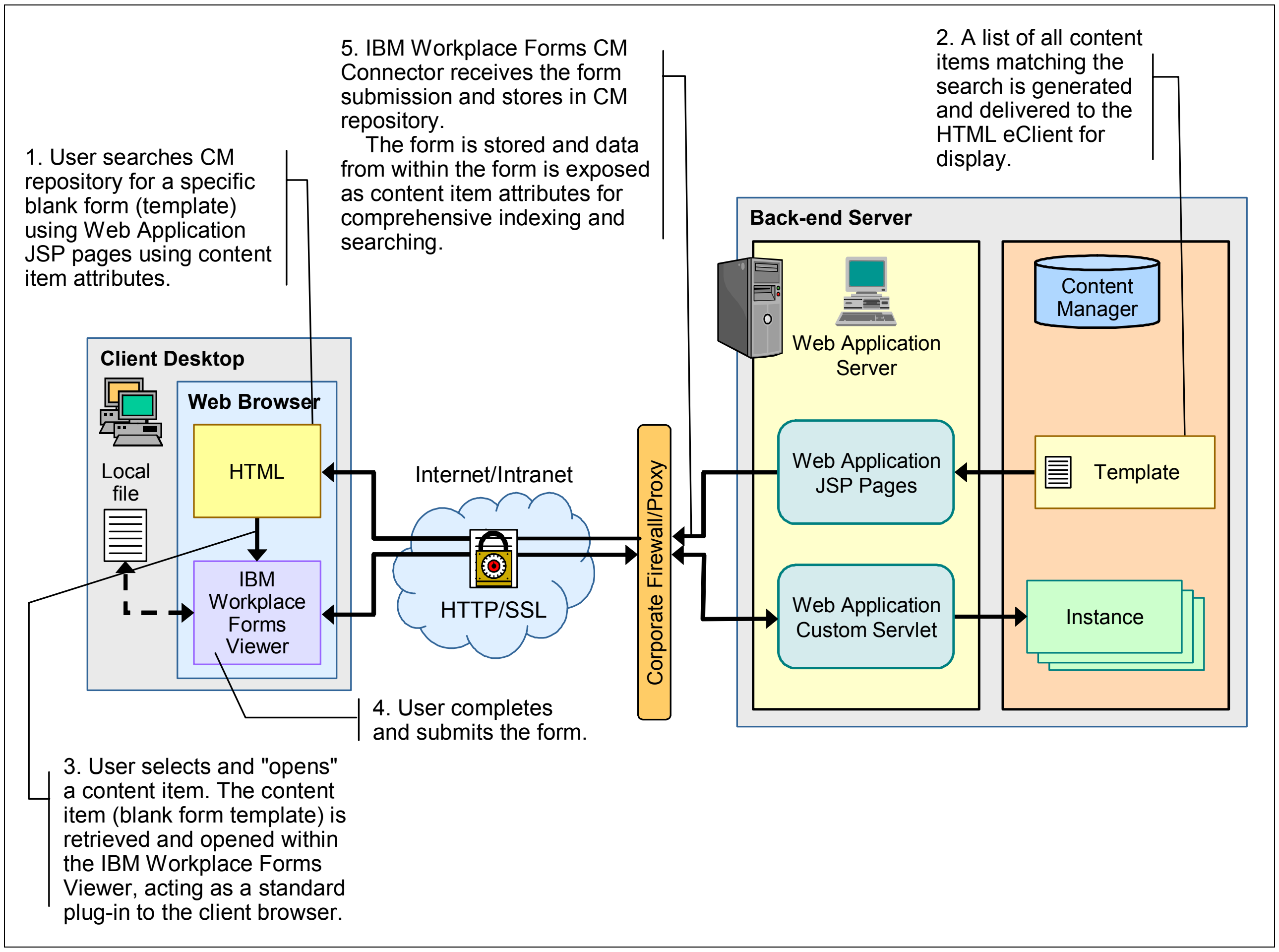

5. IBM Workplace Forms CM Connector receives the form submission and stores in CM repository.
The form is stored and data from within the form is exposed as content item attributes for comprehensive indexing and searching.
2. A list of all content items matching the search is generated and delivered to the HTML eClient for display.
1. User searches CM repository for a specific blank form (template) using Web Application JSP pages using content item attributes.
Back-end Server
Web Application Server
Content Manager
Client Desktop
Web Browser
Local file
HTML
Internet/Intranet
HTTP/SSL
Corporate Firewall/Proxy
Web Application JSP Pages
Template
IBM Workplace Forms Viewer
Web Application Custom Servlet
Instance
4. User completes and submits the form.
3. User selects and "opens" a content item. The content item (blank form template) is retrieved and opened within the IBM Workplace Forms Viewer, acting as a standard plug-in to the client browser.

Figure 8-2 Typical sequence of steps for Workplace Forms and CM interaction

The described CM connector is a custom servlet that performs the interaction with the DB2 CM instance. In the following section we use a sample implementation of a CM Submission servlet that is part of the IBM DB2 Content Manager Demo platform. However, the basic concept and functionality of the servlet described here is applicable to any type of Web application that performs this integration.

The typical sequence of steps for the CM integration is:

1. The user searches the CM repository for a specific blank form (template) using Web Application JSP pages using content item attributes. The template forms would likely be stored in CM in this solution. However, in the Redbooks scenario, we have implemented several repository solutions and chose to slightly modify the sample Template List JSP and leave the templates in the file system to reduce the coding effort.
2. A list of all content items matching the search is generated and delivered to the HTML eClient for display.
3. The user selects and *opens* a content item. The content item (blank form template) is retrieved and opened within the IBM Workplace Forms Viewer, acting as a standard plug-in to the client browser.

4. The user completes and submits the form.
5. IBM Workplace Forms CM Connector receives the form submission and stores it in the CM repository. The form is stored and data from within the form is exposed as content item attributes for comprehensive indexing and searching.

For the scenario we describe in this book, the Content Manager does not serve as a repository for form templates. We extended our example described in the previous chapters by both submitting completed forms to the Content Manager using a Submit button, and by submitting only approved forms to the Content Manager using servlet-to-servlet communication, as described in 8.3.3, “Servlet-to-servlet communication” on page 486.

Note: There are several versions of the CM submission servlet available and used in different integration packages. The all rely on the same basic ideas discussed above. The detailed configuration applied in the XFDL form (for example, IDs and element names of the XML or XForms instances to create) and the administration steps to process in Content Manager environment can vary. For these steps, see the installation and administration instructions coming with the integration package you are going to use.

We provide here a configuration sample used in a *pure* CM integration demo sample and a configuration sample used in a Forms 2.6 integration kit for Information Integrator Content Edition (IICE).

8.2 Basic design of Content Manager integration

A basic connector to the Content Manager as described here makes it simple for developers to:

- Store forms as items in Content Manager (with attribute values set based on form data).
- Retrieve form items from Content Manager.
- Update existing form items within Content Manager.

Figure 8-3 illustrates the basic design of the Forms-CM integration.

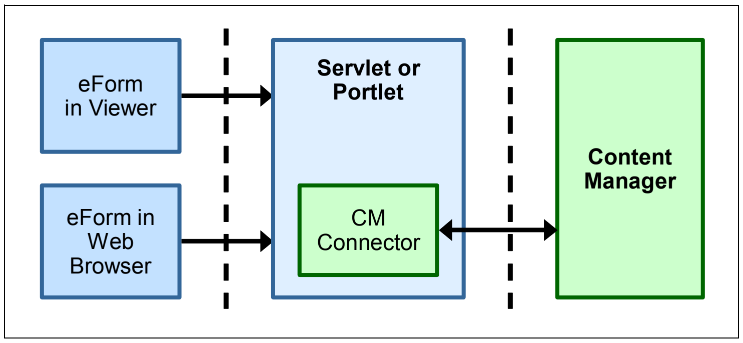


Figure 8-3 Basic design of Workplace Forms and CM integration

On the left is the Workplace Forms Viewer invoked either standalone or from within a Web browser. The form is filled in as needed and then submitted via a Submit button. This causes the servlet (middle section) to be executed, which processes the form, extracting the item type, attributes, and other form data, and stores the entire filled-in form into CM. If the Form Viewer is invoked to display an existing form saved to CM using this servlet, then the stored form is updated.

The ContentManagerMetaData instance contains all of the information needed to describe this form's integration to Content Manager, thus making the form document completely self-describing with regards to how it is stored or represented in Content Manager.

We add the instance data model required and bind certain fields in the form to this instance data model. The current servlet provided on the CM Demo Platform has very specific requirements for integration. Specifically, two entities must exist:

- An invisible field is added to the form for the CM PID (generated when a form is stored in CM) and must be called PID.
- Example 8-1 shows the syntax required by the servlet (shown here in the form's XML format with our comments added). This is an example of what must be defined in the data instance model.

Example 8-1 Data instance model required by the CMSubmission servlet

```
<!-the ID MUST BE CMAttributes -->
<xforms:instance xmlns=http://www.PureEdge.com/XFDL/Custom id="CMAttributes">
< !-the ContenManagerMetaData tag is required -->
   <ContentManagerMetaData>
   <!-insert the name of the Item Type in CM -->
      <ItemType>MyForm</ItemType>
      <!-insert the number of Attributes that will be used -->
      <NumberItemAttributes>4</NumberItemAttributes>
      <! - repeating tags occur now as necessary for the number of Attributes -->
      <!-insert the Attribute Name here -->
      <ItemAttributeName0>MyFirstAttr</ItemAttributeName0>
      <!-this will contain the Attribute Value when the form is completed -->
      <ItemAttributeValue0></ItemAttributeValue0>
      <ItemAttributeName1>MySecondAttr</ItemAttributeName1>
      <ItemAttributeValue1>External Wire Transfer Request</ItemAttributeValue1>
      <ItemAttributeName2>MyThirdAttr</ItemAttributeName2>
      <ItemAttributeValue2></ItemAttributeValue2>
      <ItemAttributeName3>MyFourthAttr</ItemAttributeName3>
      <ItemAttributeValue3></ItemAttributeValue3>
      <!- the tags above must follow the sequence up to the required number -->
      <!-PID is a required entry and will be filled in when the form is completed -->
      <PID></PID>
      <!-CMUserName will default to icmadmin if not provided here -->
      <CMUserName>icmadmin</CMUserName>
      <!-CMUserPassword will default to password if not provided here -->
      <CMPassword>password</CMPassword>
      <!-CMLibServerName will default to icmnlsdb if not provided here -->
      <CMLibServerName>icmnlsdb</CMLibServerName>
      <!-CMSchemaName will default to SCHEMA=ICMADMIN if not provided here -->
      <CMSchemaName>SCHEMA=ICMADMINicmadmin</CMSchemaName>
      <!-ItemMimeType will default to application/vnd.xfdl if not provided here -->
      <ItemMimeType>application/vnd.xfdl</ItemMimeType>
    </ContentManagerMetaData>
</xforms:instance>
```

The preceding example shows the syntax required by the servlet initial version as provided for Forms 2.5 integration. The tag values (that is, the information between the tag pairs) are just examples in this case.

The key information here is

- The stored instance ID (CMAttributes)
- The stored item class in CM providing the appropriate meta data configuration (ItemType)

- The data available for extraction stored in element pairs ItemAttributeNameX / ItemAttributeValueX containing the attribute name in CM and the value to assign to the attribute

The newer integration assets (for example, the IICE integration sample shown in Example 8-2) are much more flexible. The provided submission servlet (Version 2.x) can accept compressed forms, and accepts much more flexible input data. This results in a slightly more complex structure of the data instances to apply. In the sample below, we can see three different instances to configure in the XFDL form:

- applicationData instance - This instance is related to an xfdl form internal framework. The goal here is to serve a generic prepopulation and data retrieval engine caring about the submission URL to set on form open and the form state and other workflow-related information to track on form submit.
- integrator_repo_location instance - This instance provides form-independent information about the target system storing the form on form submit (repository/path/instanceid) containing the target repository ID, the repository-specific unique ID for the stored form, and the ID of the XForms instance to extract on form submission. This makes it possible to serve with the integration framework different target systems using a common submission gateway.
- Buyer instance - The named instance for data extraction form submission. The data contained in this instance should be reflected in the object meta data in the target system and the update on each form submission. The ID of this instance is declared in the integrator_repo_location instance. The element iice_itemClassName detects the object type (item class) for which we configured the meta data. The other elements contain the meta data to extract. We do not operate with element pairs (name/value) here. The element name must exactly match here the configured meta data attribute name in the target system. The element value is the value to assign. This makes it possible to map complex data structures, as shown for the PO_Lines elements, that can contain data for multiple lines in a table.

Example 8-2 Data instance model required by CMSubmission servlet used in IICE integration kit

```
<xforms:model id="model1">
   <xforms:instance id="applicationData" xmlns="">
     <formData>
        <Submit_URL>
           http://localhost:9090/forms_webclient/wfi/service/submit
        </Submit_URL>
        <Form_State>1</Form_State>
        <same_as_billing_check>true</same_as_billing_check>
     </formData>
   </xforms:instance>

   <xforms:instance id="integrator_repo_location"
   xmlns="http://www.ibm.com/xmlns/prod/workplace/forms/integrator/repo/location/1.0">
     <location>
        <newinstance>
           <repository>iice-repository</repository>
           <path>
           /NOINDEX.A1001001A06F17B70838A48569.A06F17B70838A48569.1000/abcd.xfdl
           </path>
        </newinstance>
        <mapping type="inline">
           <instanceid
   xmlns="http://www.ibm.com/xmlns/prod/workplace/forms/integrator/mapping/inline/1.0">
              Buyer
           </instanceid>
```

```
            </mapping>
        </location>
    </xforms:instance>

    <xforms:instance id="Buyer"
    xmlns="http://www.ibm.com/xmlns/prod/workplace/forms/integrator/repo/metadata/1.0">
        <data>
            <iice_itemClassName>SamplePO</iice_itemClassName>
            <Company_Name></Company_Name>
            <Company_ID></Company_ID>
            <Contact_Name></Contact_Name>
            ....
            <PO_Lines>
                <PO_Line>
                    <product_ID></product_ID>
                    <quantity></quantity>
                    <line_total></line_total>
                </PO_Line>
            </PO_Lines>
            <SubTotal></SubTotal>
            <Tax></Tax>
            <Total></Total>
        </data>
    </xforms:instance>
</xforms:model>
```

In the next sections we describe how to enhance our existing sales quote application to store the forms along with some meta data attributes in DB2 Content Manager.

8.3 Integrating the sales quote sample with DB2 Content Manager

This section describes the configuration steps to process for a submission servlet 1.x type integration. To integrate our sales quote sample application with IBM DB2 Content Manager, we have to perform essentially the following tasks:

1. Create attributes and item types in DB2 Content Manager.
2. Add the CM integration in the form.
3. Enhance our submission servlet to post the form to the Content Manager submission servlet.

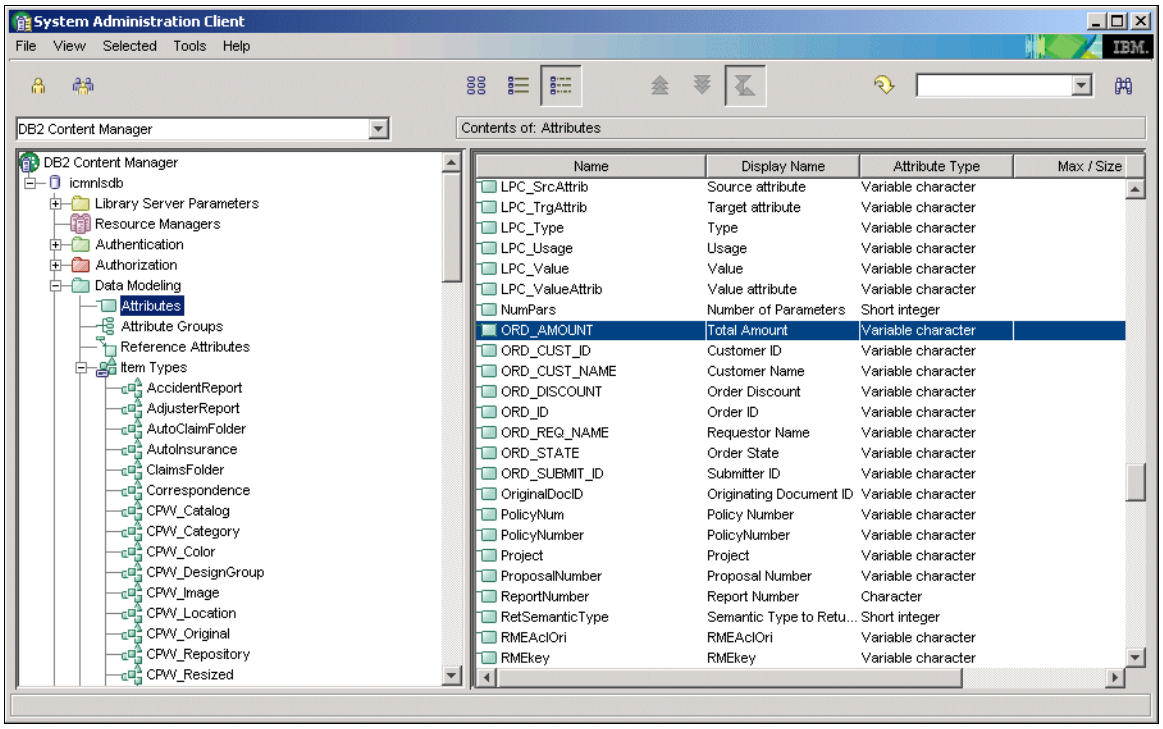
The necessary steps are described in the next two sections.

8.3.1 Create attributes and item types

To create the Content Manager item type and attributes:

1. Start the IBM Content Manager System Administration Client by selecting **Start** → **Programs** → **IBM DB2 Content Manager Enterprise Edition** → **System Administration client**.
    a. Log in with the respective user ID and password.

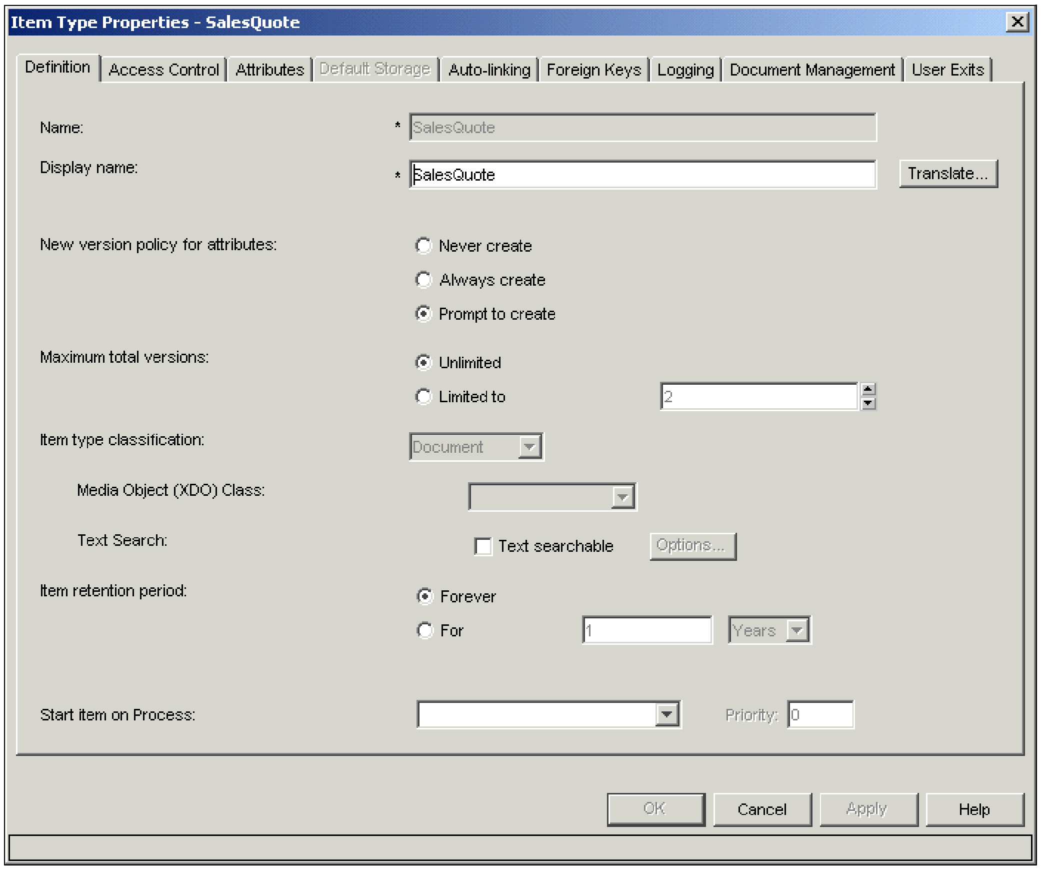
b. You will see the System Administration Client, as shown in Figure 8-4.



Name	Display Name	Attribute Type	Max / Size
LPC_SrcAttrib	Source attribute	Variable character	
LPC_TrgAttrib	Target attribute	Variable character	
LPC_Type	Type	Variable character	
LPC_Usage	Usage	Variable character	
LPC_Value	Value	Variable character	
LPC_ValueAttrib	Value attribute	Variable character	
NumPars	Number of Parameters	Short integer	
ORD_AMOUNT	Total Amount	Variable character	
ORD_CUST_ID	Customer ID	Variable character	
ORD_CUST_NAME	Customer Name	Variable character	
ORD_DISCOUNT	Order Discount	Variable character	
ORD_ID	Order ID	Variable character	
ORD_REQ_NAME	Requestor Name	Variable character	
ORD_STATE	Order State	Variable character	
ORD_SUBMIT_ID	Submitter ID	Variable character	
OriginalDocID	Originating Document ID	Variable character	
PolicyNum	Policy Number	Variable character	
PolicyNumber	PolicyNumber	Variable character	
Project	Project	Variable character	
ProposalNumber	Proposal Number	Variable character	
ReportNumber	Report Number	Character	
RetSemanticType	Semantic Type to Retu...	Short integer	
RMEAclOri	RMEAclOri	Variable character	
RMEkey	RMEkey	Variable character	

Figure 8-4 DB2 Content Manager System Administration Client

2. Create a new item type for the form:
   a. Expand the **Data Modeling** tree in the left-hand pane and right-click **Item Types**.
   b. Select **New**.
   c. You will see the **Item Type Properties** dialog, as shown in Figure 8-5.

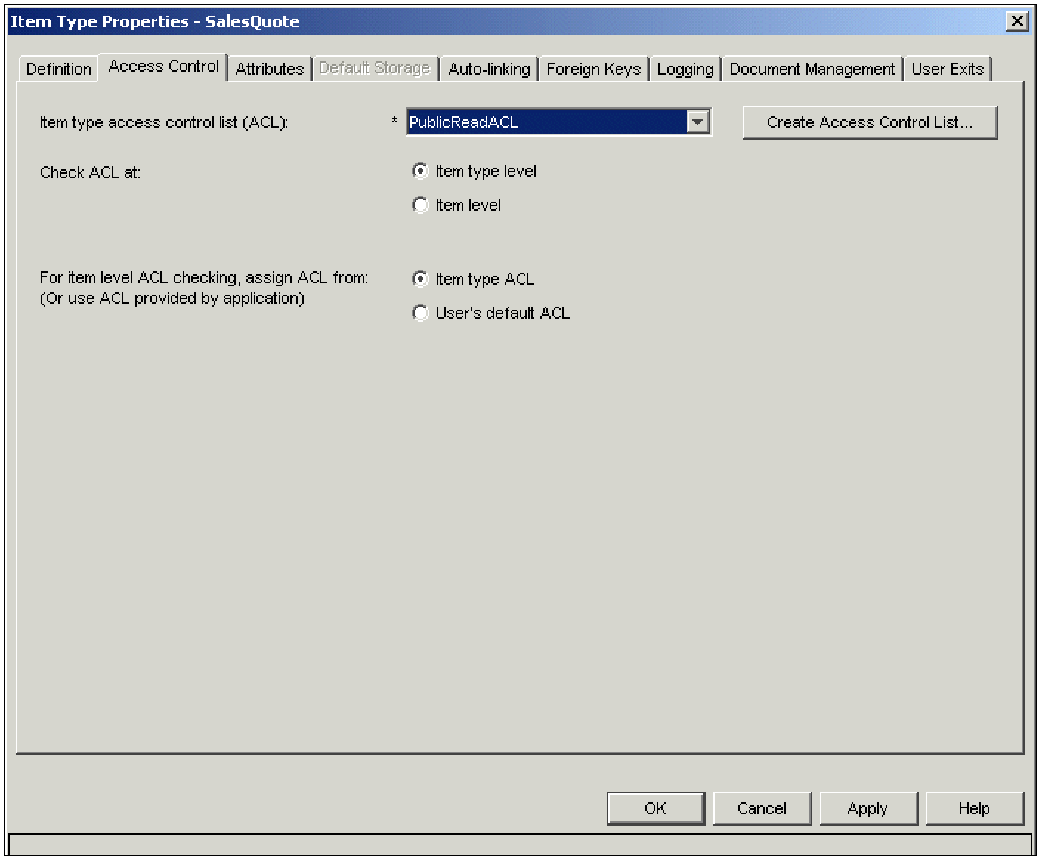

Item Type Properties - SalesQuote

Name: * SalesQuote
Display name: * SalesQuote
New version policy for attributes: Never create / Always create / [✓ Prompt to create]
Maximum total versions: [✓ Unlimited] / Limited to 2
Item type classification: Document
Media Object (XDO) Class:
Text Search: Text searchable
Item retention period: [✓ Forever] / For 1 Years
Start item on Process: Priority: 0

Figure 8-5 Item Type Properties dialog

3. On the Definition tab:
   a. Enter `SalesQuote` for the name and display name.
   b. Select **Prompt to create** as the new version policy attribute.

4. On the ACL tab (shown in Figure 8-6) select **PublicReadACL** for Item type access control list (ACL).


Item Type Properties - SalesQuote

Item type access control list (ACL): * PublicReadACL

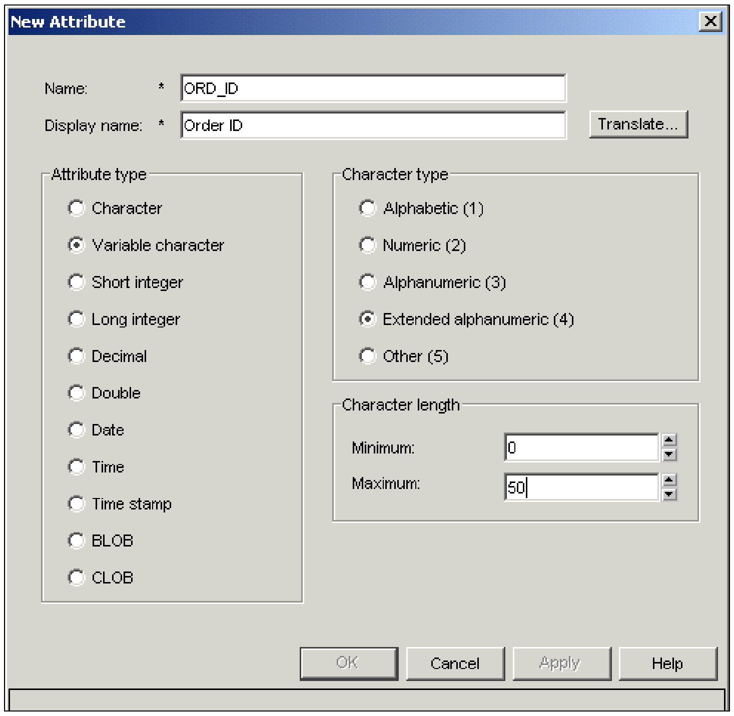
Check ACL at: (●) Item type level ( ) Item level

For item level ACL checking, assign ACL from:
(Or use ACL provided by application)
(●) Item type ACL ( ) User's default ACL

Figure 8-6 Access Control tab of Item Type Properties dialog

5. On the Attributes tab:

   a. Click the New Attribute button ( ). The New Attribute dialog opens, as seen in Figure 8-7.



New Attribute

Name: * ORD_ID

Display name: * Order ID

Attribute type: ( ) Character [✓ Variable character] ( ) Short integer ( ) Long integer ( ) Decimal ( ) Double ( ) Date ( ) Time ( ) Time stamp ( ) BLOB ( ) CLOB

Character type: ( ) Alphabetic (1) ( ) Numeric (2) ( ) Alphanumeric (3) [✓ Extended alphanumeric (4)] ( ) Other (5)

Character length: Minimum: 0 Maximum: 50

Figure 8-7 New Attribute dialog

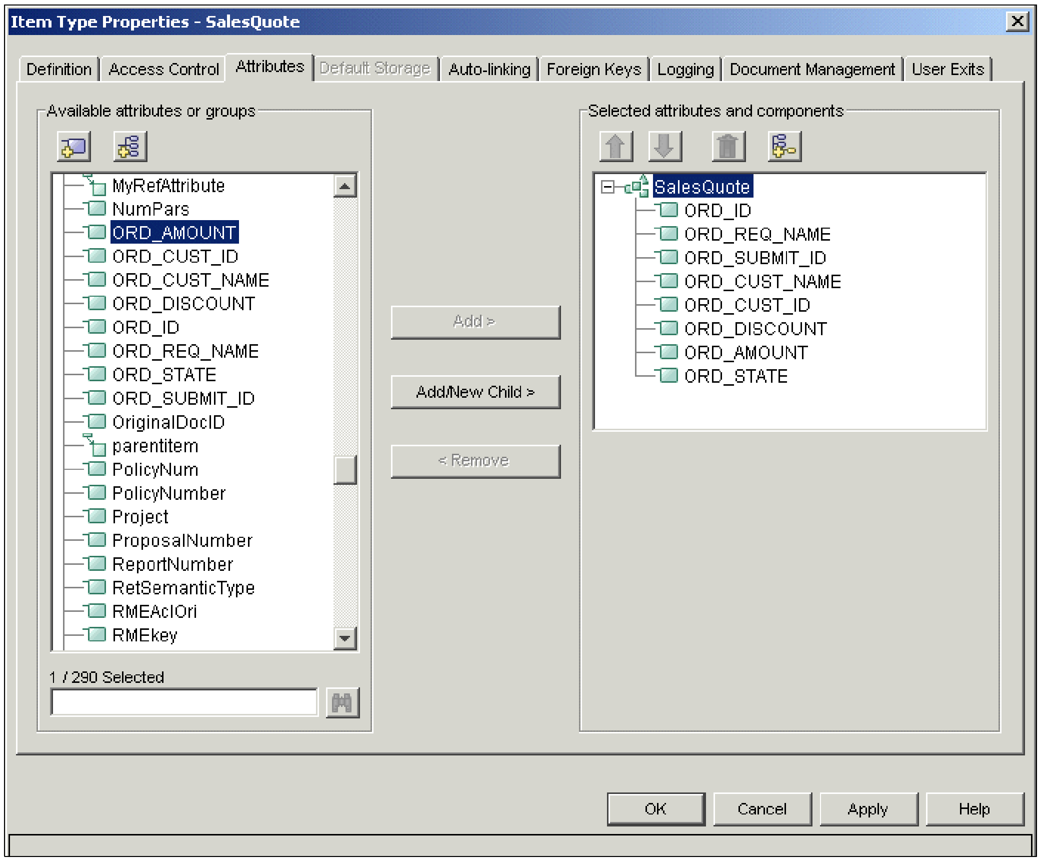
   b. Enter the following values:

      i. Name = `ORD_ID`
      ii. Display name = `Order ID`
      iii. Attribute type = **Variable Character**
      iv. Character type = **Extended alphanumeric**
      v. Length Maximum = **50**
      vi. Click **Apply**.

   c. Repeat step b. to add these attributes with the following names and display names:

      - ORD_SUBMIT_ID - Requestor ID
      - ORD_REQ_NAME - Requestor Name
      - ORD_CUST_ID - Customer ID
      - ORD_CUST_NAME - Customer Name
      - ORD_AMOUNT - Total Amount
      - ORD_DISCOUNT - Discount
      - ORD_STATE - Order State

d. Now select these eight attributes (use the Ctrl key to make multiple selections) and click the **Add >** button, as seen in Figure 8-8.



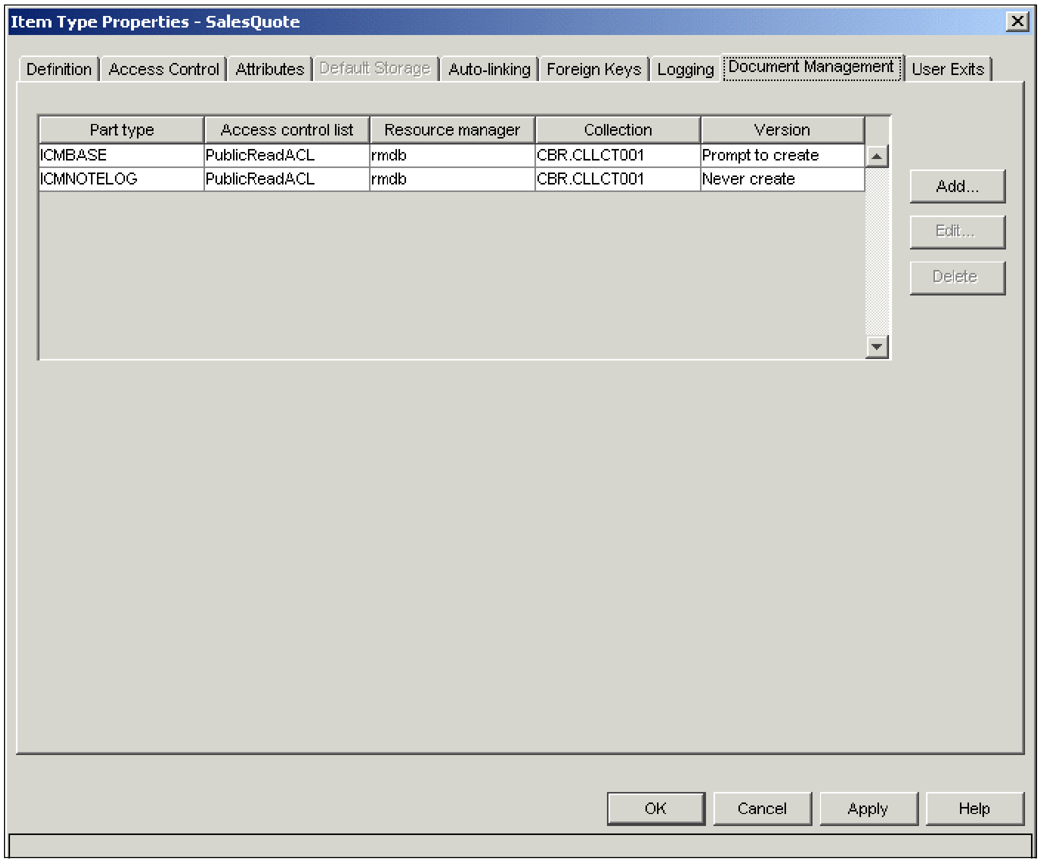
MyRefAttribute
NumPars
ORD_AMOUNT
ORD_CUST_ID
ORD_CUST_NAME
ORD_DISCOUNT
ORD_ID
ORD_REQ_NAME
ORD_STATE
ORD_SUBMIT_ID
OriginalDocID
parentitem
PolicyNum
PolicyNumber
Project
ProposalNumber
ReportNumber
RetSemanticType
RMEAclOri
RMEkey

1 / 290 Selected

SalesQuote
ORD_ID
ORD_REQ_NAME
ORD_SUBMIT_ID
ORD_CUST_NAME
ORD_CUST_ID
ORD_DISCOUNT
ORD_AMOUNT
ORD_STATE

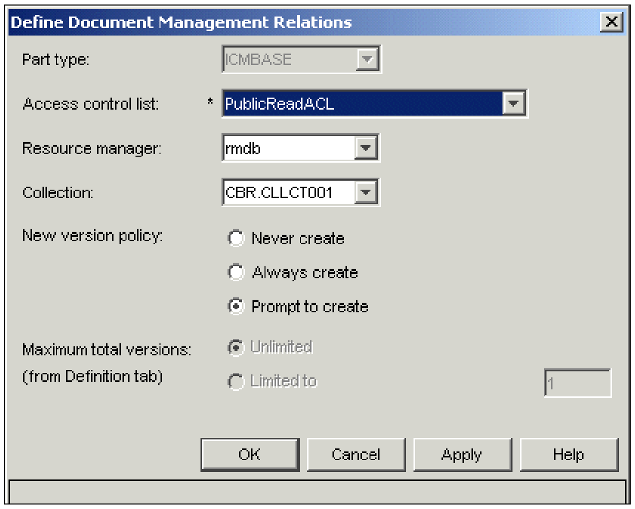
Figure 8-8 Attributes tab of the Item Types dialog

6. On the Document Management tab, as seen in Figure 8-9, make the following selections.
   a. Click **Add**. The Define Document Management Relations dialog opens, as seen in Figure 8-10.
   b. Select **ICMBASE** for the Part Type field.
   c. Select **PublicReadACL** for the Access control list field. Click **OK**.



Part type	Access control list	Resource manager	Collection	Version
ICMBASE	PublicReadACL	rmdb	CBR.CLLCT001	Prompt to create
ICMNOTELOG	PublicReadACL	rmdb	CBR.CLLCT001	Never create

Figure 8-9   Document Management tab of the Item Types dialog



Part type: ICMBASE
Access control list: * PublicReadACL
Resource manager: rmdb
Collection: CBR.CLLCT001
New version policy: ( ) Never create ( ) Always create (●) Prompt to create
Maximum total versions: (from Definition tab) (●) Unlimited ( ) Limited to 1

Figure 8-10   Define Document Management Relations dialog

d. Click **Add** again.

e. Select **ICMNOTELOG** for the Part Type field.

f. Click **OK** and click **OK** again. The CM item type `SalesQuote` should appear in the list of item types (right-hand pane).

7. Add the **XFDL MIME Type** to Content Manager.

   a. Click the **MIME Types** entry in the right-hand pane tree. Sort the list Z–A. You should see `XFDL` near the top.

   b. Double-click **XFDL** and you see the properties required:

      - Name = XFDL
      - Display name = XFDL
      - MIME type = application/vnd/xfdl
      - Suffixes = .xfd

   c. Click **Cancel**.

8. Add XFDL MIME type processing for the Client for Windows.

   a. Start the IBM Content Manager Client for Windows by selecting **Start** → **Programs** → **IBM DB2 Content Manager Enterprise Edition** → **Client for Windows**.

   a. Log in with the respective user ID and password.

   b. Select **Options** → **Preferences** → **Helper Applications**. Scroll to the bottom of the list to find XFDL. This information comes from the library server and does not need to be changed. The client for Windows relies on Windows to launch the correct application (in this case the Workplace Forms Viewer).

9. Add XFDL MIME type processing for the eClient.

   a. View the file IDMAdminDefaults.properties located at C:\IBM\db2cmv8\CMeClient.

   b. Search for `xfd` and you see that a line was added for the XFDL MIME type, that is, application/vnd.xfdl=launch is added to the MIME Type action list of MIME types.

8.3.2 Add the CM integration in the form

To be able to store our form in DB2 Content Manager, we have to add some CM-specific items to the form. Open the form in Workplace Forms Designer and perform the following steps to define a data instance model for Content Manager:

1. Create the data instance CMMetaData in the form.

Example 8-3 Code listing of data attributes

```
<xforms:instance xmlns="" id="CMMetaData">
   <ContentManagerMetaData>
      <PID></PID>
      <ItemType>SalesQuote</ItemType>
      <NumberItemAttributes>8</NumberItemAttributes>
      <ItemAttributeName0>ORD_ID</ItemAttributeName0>
      <ItemAttributeValue0></ItemAttributeValue0>
      <ItemAttributeName1>ORD_CUST_ID</ItemAttributeName1>
      <ItemAttributeValue1></ItemAttributeValue1>
      <ItemAttributeName2>ORD_AMOUNT</ItemAttributeName2>
      <ItemAttributeValue2></ItemAttributeValue2>
      <ItemAttributeName3>ORD_DISCOUNT</ItemAttributeName3>
      <ItemAttributeValue3></ItemAttributeValue3>
      <ItemAttributeName4>ORD_STATE</ItemAttributeName4>
      <ItemAttributeValue4></ItemAttributeValue4>
      <ItemAttributeName5>ORD_SUBMIT_ID</ItemAttributeName5>
      <ItemAttributeValue5></ItemAttributeValue5>
      <ItemAttributeName6>ORD_REQ_NAME</ItemAttributeName6>
      <ItemAttributeValue6></ItemAttributeValue6>
      <ItemAttributeName7>ORD_CUST_NAME</ItemAttributeName7>
      <ItemAttributeValue7></ItemAttributeValue7>
   </ContentManagerMetaData>
</xforms:instance>
```

2. Next we bind the fields into the data instance. Be aware that there are ways to mutually synchronize the data in the instance with the data contained in the form. We have already defined an XForms instance containing all of the data provided with the form. We have to make sure that the data available for CM integration is updated at least when the form is submitted.

   We have to read the data from any already existing XForms instance elements and assign the data to the corresponding ItemAttributeValueX-elements in the CMMetaData instance. This can be done using XForms binds assigned to the model or XFDL formulas using get/set operations fired, for example, in the submit button.

3. Since the data in the instance (at least the PID on first submission and ORD_STATE on each signature change) will alter, we must exclude the CMMetaData instance from the signing procedures.

Now we have created the form items, data instance, and bindings for the DB2 Content Manager integration. We test the integration in the following section.

8.3.3 Servlet-to-servlet communication

To integrate the existing submission servlet with the supposed Content Manager environment, we have to enable the SubmissionServlet installed on the WebSphere Application Server (WAS) 5.1 server to submit a received form to Content Manager. The new integration scenario is shown in Figure 8-11.

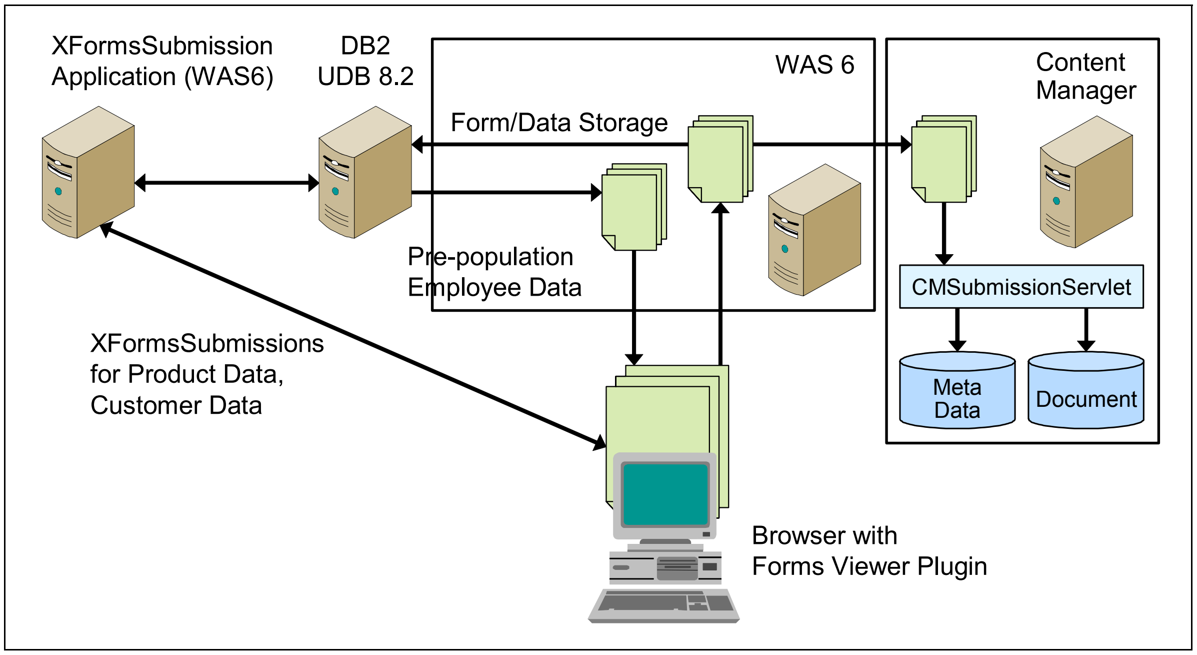

XFormsSubmission Application (WAS6)
DB2 UDB 8.2
WAS 6
Form/Data Storage
Content Manager
Pre-population Employee Data
CMSubmissionServlet
XFormsSubmissions for Product Data, Customer Data
Meta Data
Document
Browser with Forms Viewer Plugin

Figure 8-11 Integration scenario with form submission to Content Manager

We add the following code to the WPForms261Stage2 servlet project:

- Create a new property CMSubmissionUrl to the order.properties file. Here we store the URL to the Content Manager servlet to be able to receive the submitted form. If this property is missing or empty, the SubmissionServlet should work as in stage 2 (assuming that there is no CM integration).
- Create a new attribute CMSubmissionUrl in the SubmissionServlet class and adopt the init method to fill the attribute with the parameter value from the properties file.
- Add an extension to the doPost method that submits a received from to Content Manager servlet, if a URL to the servlet is specified.
- Create an additional generic support function processing a post message used for form submission to CM.

Note: To keep the use case consistent with the stage 2 scenario, we choose here to extend the J2EE application storing a received XFDL file in DB2 (as in stage 2) and submitting it in parallel to CM (new). ´This allows us to work with forms stored in the DB2 database and use CM only for archiving (storing in parallel a version of the submitted). In other environments, the choice could be to alter the submission buttons in the provided form to point directly to the installed CMSubmission servlet.

Having available the stage 2 SubmissionServlet as prepared in Chapter 6, “Building the base scenario: stage 2” on page 367, we can easily extend the existing code with the lines in Example 8-4 through Example 8-7.

Example 8-4 Add a new property to the order.properties file (adjust server name and servlet path

```
#path to Content Manager instance
CMSubmissionUrl=http://cmhostname/formdemo/CMSubmissionServlet
```

Example 8-5 Add a new attribute in the SubmissionServlet class

```
// *** CM Integration ***
   //URL for Content manager integration
   private static String CMSubmissionUrl;
// *** CM Integration ***
```

Example 8-6 Read the property in the init method of SubmissionServlet class

```
//       *** CM Integration ***
         CMSubmissionUrl = orderProps.getProperty("CMSubmissionUrl");
         if (CMSubmissionUrl == null){CMSubmissionUrl = "";}
         System.out.println("CMSubmissionUrl: "+ CMSubmissionUrl);
//       *** CM Integration ***
```

Example 8-7 Add code submitting the form to CM in the doPost event

```
//             *** CM Integration ***
               if (formState.equals("4") && (!CMSubmissionUrl.equals(""))) {
                  String url = "";
                  if (previousFormState.equals("4")) {
                     url = CMSubmissionUrl + "?action=update";
                  } else {
                     url = CMSubmissionUrl + "?action=store";
                  }
                  System.out.println("Submitting form to cmdemo: " + url);
                  String respHTML = sendPost(url, strXFDL,"application/vnd.xfdl");
                  System.out.println("CM sent");
                  System.out.println(respHTML);
               }
//             *** CM Integration ***
```

The new supporting method submits a received form to CMSubmissionServlet installed in the Content Manager test environment. CMSubmissionServlet can send a response. We do not analyze it here. A print to System.out logs the successful transmission or any errors (Example 8-8).

Example 8-8 Supporting method processing a post request

```
   public static String sendPost(String urlStrg, String content, String contentType)
         throws IOException {
      URL url;
      URLConnection urlConn;
      DataOutputStream printout;
      BufferedReader in;
      String result = "";
      try {
         // create URL, open URL connection
         url = new URL(urlStrg);
         urlConn = url.openConnection();
         // activate input and output, no cache
```

```
        urlConn.setDoInput(true);
        urlConn.setDoOutput(true);
        urlConn.setUseCaches(false);
        // set content type
        urlConn.setRequestProperty("Content-Type", contentType);
        // Now sent POST mesage.
        printout = new DataOutputStream(urlConn.getOutputStream());
        printout.writeBytes(content);
        printout.flush();
        printout.close();
        // Get response
        String str;
        in= new BufferedReader(new InputStreamReader(urlConn.getInputStream()));
        while (null != ((str = in.readLine())))
        {
           result = result + str;
           System.out.println(str);
        }
        in.close();
     } catch (MalformedURLException e) {
        e.printStackTrace();
     }
     return result;
  }
```

Having these changes applied to the RAD project, we should create a new EAR file and deploy it to the application server. Since there is already an application WPForms261Stage2, we have to update the existing enterprise application with the new EAR file.

Note: We choose here the approach to control the submission to Content Manager based on a property stored in the application and the state of the submitted form. There are other valid scenarios as well (application-based only, or alternatively, form-based only).

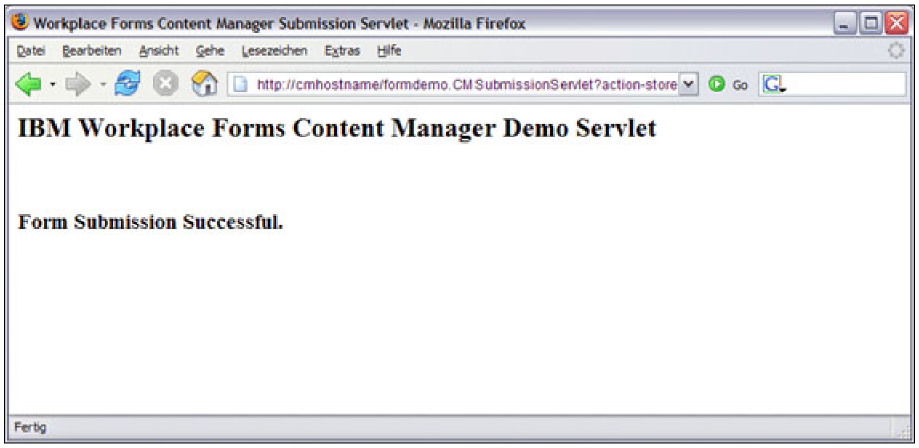
8.3.4 Test the form integration with CM

To test the form integration, we fill out a form and submit it to DB2 Content Manager. Then we use the eClient to search for our form and metadata. Follow these steps to test your form integration with DB2 Content Manager:

1. Be sure that all necessary servers are up and running:
   - WebSphere Application Server (WAS) server1 (where the servlet is deployed)
   - Content Manager Resource Manager server
   c. eClient server
2. Fill in your form using the Workplace Forms Viewer.
   a. Open the Forms Selection JSP with the URL:

      `http://vmforms261.cam.itso.ibm.com:10000/WPForms261Stage2/`
   b. Click **New Orders**.
   c. Select the forms template you deployed with design changes for the CM integration. (For test purposes, we can added a submission button *Store a new Quote in CM* pointing to the CMSubmissionServlet in one of the form pages.)
   d. Fill out the form.
   e. On the toolbar of the traditional form page, click the button **Store a new Quote in CM**.

You should see the submission confirmation, as shown in Figure 8-12.


Workplace Forms Content Manager Submission Servlet - Mozilla Firefox
Datei Bearbeiten Ansicht Gehe Lesezeichen Extras Hilfe
http://cmhostname/formdemo.CMSubmissionServlet?action=store
Go

IBM Workplace Forms Content Manager Demo Servlet

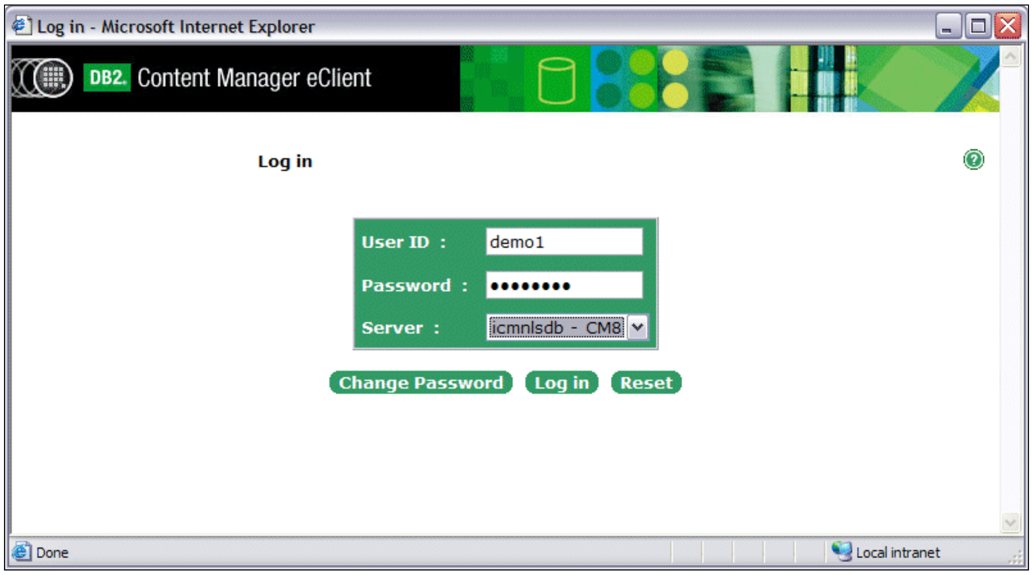
Form Submission Successful.

Figure 8-12 Form submission confirmation

3. Search and display your submitted forms in the DB2 Content Manager eClient. Start the eClient by clicking the desktop icon or using following URL:

   `http://cmhostname:9083/eclient/IDMLogon2.jsp`

   Then log in to DB2 Content Manager with your valid credentials, as shown in Figure 8-13.


Log in - Microsoft Internet Explorer
DB2. Content Manager eClient
Log in

User ID : demo1

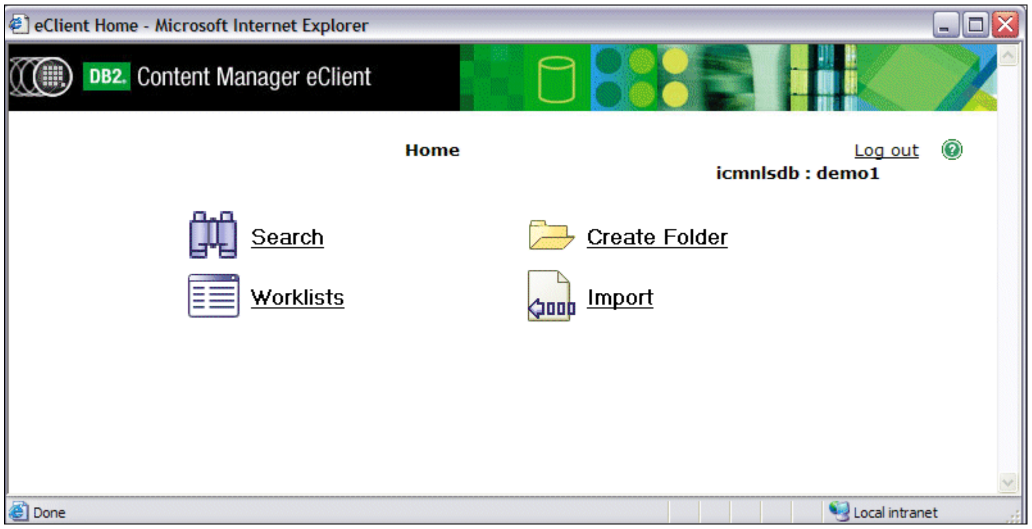
Password : ••••••••

Server : icmnlsdb - CM8

Change Password
Log in
Reset
Done
Local intranet

Figure 8-13 DB2 Content Manager eClient login

4. Click **Search** to open the Item Type List, as shown in Figure 8-14.


eClient Home - Microsoft Internet Explorer

DB2. Content Manager eClient

Home

Log out

icmnlsdb : demo1

Search

Create Folder

Worklists

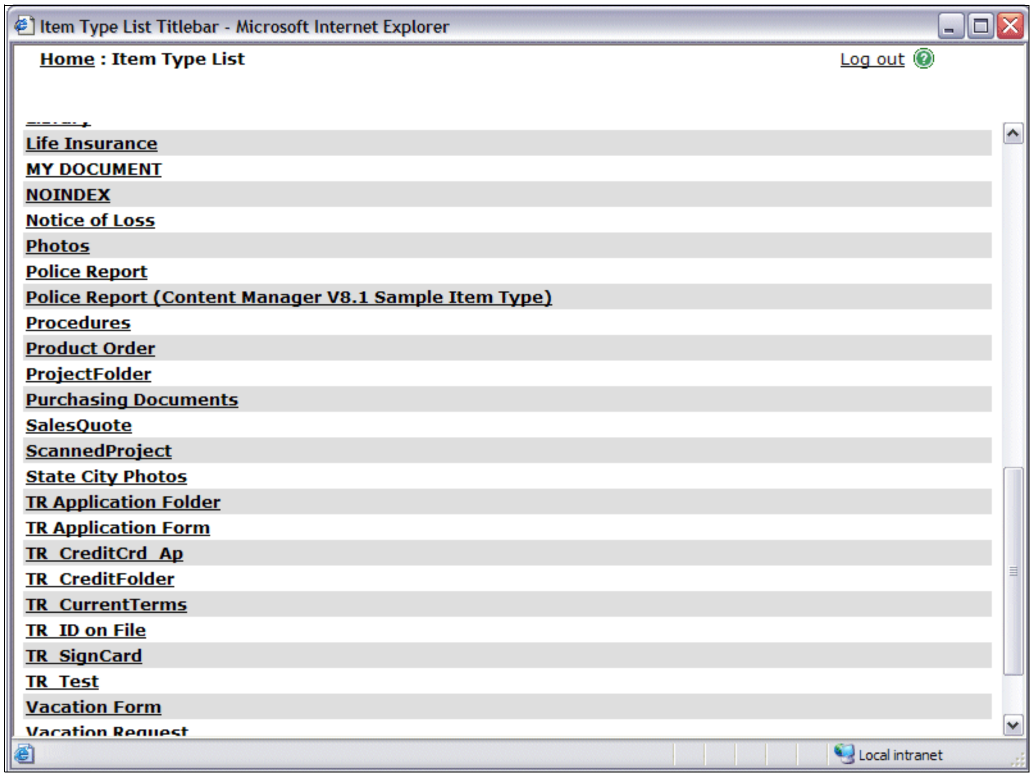
Import

Done

Local intranet

Figure 8-14 DB2 Content Manager eClient home page

a. Scroll down and click **Sales Quote**, as shown in Figure 8-15.


Item Type List Titlebar - Microsoft Internet Explorer

Home : Item Type List

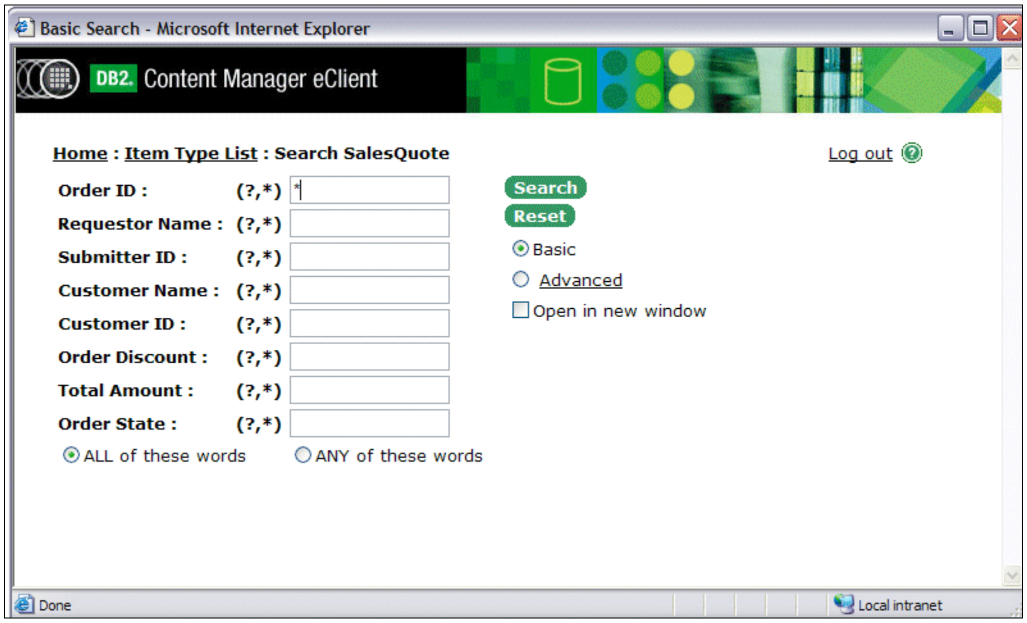
Log out

Life Insurance
MY DOCUMENT
NOINDEX
Notice of Loss
Photos
Police Report
Police Report (Content Manager V8.1 Sample Item Type)
Procedures
Product Order
ProjectFolder
Purchasing Documents
SalesQuote
ScannedProject
State City Photos
TR Application Folder
TR Application Form
TR_CreditCrd_Ap
TR_CreditFolder
TR_CurrentTerms
TR_ID on File
TR_SignCard
TR_Test
Vacation Form
Vacation Request

Local intranet

Figure 8-15 DB2 Content Manager eClient Item Type List

b. Enter an asterisk (*) in the Order ID field and click **Search**, as shown in Figure 8-16.



Basic Search - Microsoft Internet Explorer

DB2. Content Manager eClient

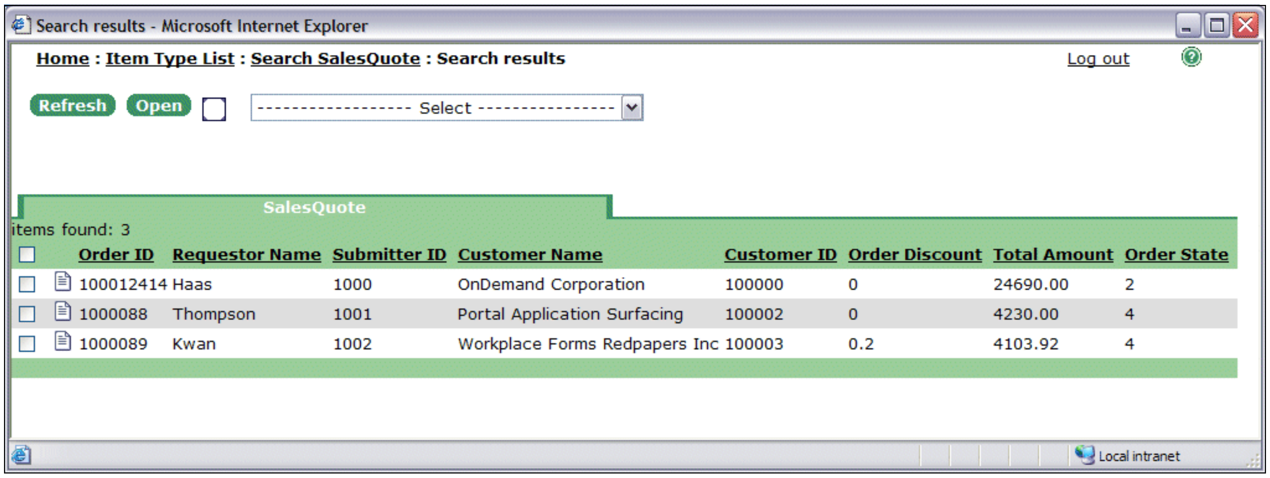
Home : Item Type List : Search SalesQuote

Order ID :	(?,*)	*
Requestor Name :	(?,*)	
Submitter ID :	(?,*)	
Customer Name :	(?,*)	
Customer ID :	(?,*)	
Order Discount :	(?,*)	
Total Amount :	(?,*)	
Order State :	(?,*)	

[✓ ALL of these words] ANY of these words

Figure 8-16 DB2 Content Manager eClient basic search

c. The Search Result page should open, as shown in Figure 8-17.



Search results - Microsoft Internet Explorer

Home : Item Type List : Search SalesQuote : Search results

SalesQuote

items found: 3

Order ID	Requestor Name	Submitter ID	Customer Name	Customer ID	Order Discount	Total Amount	Order State
100012414	Haas	1000	OnDemand Corporation	100000	0	24690.00	2
1000088	Thompson	1001	Portal Application Surfacing	100002	0	4230.00	4
1000089	Kwan	1002	Workplace Forms Redpapers Inc	100003	0.2	4103.92	4

Figure 8-17 DB2 Content Manager eClient Search results page

The Search results page shows you the submitted forms and the meta data that we specified for the Content Manager integration in a view perspective. To update an existing form, you can click the document icon at the beginning of each row. This opens the form in the Workplace Forms Viewer as a plug-in to your browser.

5. Do the same test using the original submission button in the form. This button submits the form to the extended stage 2 servlet. The servlet should submit a copy of the received from to the CM submission servlet and receive the HTML page shown in Figure 8-12 on page 489 as an HTML response.

9

Lotus Domino integration

This chapter provides several integration scenarios based on a Domino infrastructure. The first scenario builds upon the same base sample application scenario described in Chapter 5, “Building the base scenario: stage 1” on page 173, and Chapter 6, “Building the base scenario: stage 2” on page 367, but now focuses on leveraging Domino for the back-end data. The second and third scenarios demonstrate how Lotus Notes Client and Domino Server integrate with the Workplace Forms Viewer and the Webform Server, respectively.

Note: The code used for building this sample scenario application is available for download. For specific information about how to download the sample code, refer to Appendix D, “Additional material” on page 693.

Note: All specific examples shown and used when building the sample scenario application are based on the codebase for IBM Workplace Forms Release 2.6.1.

9.1 Introduction to integration of Domino and Workplace Forms

Before proceeding directly into the technical details of the integration scenarios, we provide a brief overview of the Domino server and examine how each technology (namely, the Domino server and Workplace Forms) can complement the other in the integration scenario.

IBM Lotus Domino server provides enterprise-grade collaboration capabilities that can be deployed as a core e-mail and enterprise scheduling infrastructure (IBM Lotus Domino Messaging Server), as a custom application platform (IBM Lotus Domino Utility Server), or both (IBM Lotus Domino Enterprise Server). An integral part of the IBM Workplace family, Lotus Domino server, and its client software options deliver a reliable, security-rich messaging and collaboration environment that helps companies enhance the productivity of people, streamline business processes, and improve overall business responsiveness.

One of the key features using Domino is the outstanding offline capabilities of the Notes client (security, distributed disconnected work on local replicas, efficient data replication procedure with the server environment).

Besides messaging, calendaring, and scheduling, Domino integrates document management, workflow, collaboration, and database capabilities in one comprehensive product. It can handle both structured information and unstructured information as file attachments, and it adheres to Internet standards and protocols such as HTTP, XML, POP3, IMAP4, MIME, SMTP, DIIOP, and more. It can execute Java, JavaScript, LotusScript, and Notes @Formula language.

9.1.1 How the two technologies can complement each other

Domino provides a great starting point to integrate with Forms. We can use:

- File storage capabilities to store templates and filled-in forms
- Java to access Workplace Forms API
- Built-in HTTP service and servlet engine to communicate with a browser client
- Integrated development environment to build the application

How Domino can add value to Workplace Forms

Domino can handle XFDL file attachments or mime types, store and exchange them with other systems in multiple ways (mail, Web services, connections to external data sources, access to file system, and so on), and access the content in XFDL files by Java API, built-in XML parsers, and text processing capabilities. This makes it easy to build an application that handles forms, storing them with highly sophisticated access rights to stored forms and extracted data, and attaching collaboration and workflow to form and data handling.

Using the offline capabilities of the Notes Client, these applications can work even in a distributed environments with temporarily disconnected clients.

How Workplace Forms can add value to Domino

In Domino, we can create forms with a visual editor (Domino Designer) for either a rich client (Notes) or a thin client (browser). In a rich client, we can assign nested signatures. What makes it reasonable to use Workplace Forms having those built-in capabilities?

Using Forms, we can exchange the templates and completed forms with other systems, including the layout, signatures, and internal processing rules of the form. A Domino document can exchange only its values with other systems, not the processing logic, the layout, or signatures. Furthermore, with Workplace Forms we can integrate with mutual signature methods from authenticated password acceptance to biometric (retinal scans, fingerprint readers) and PKI certificates. And last but not least, we can print out the document in a pixel precise manner.

In the scenarios we describe in this chapter, we use the Domino Enterprise Server to host the application, the Notes client for testing and maintenance for supporting data, and the Notes designer to create the code. Finally, we use Domino to work with the form layout and to provide the application navigation.

For end-user access to the application, we use the Web browser or the Notes client.

9.1.2 Workplace Forms and Lotus Notes and Domino integration scenarios

In this book we present three different scenarios for integrating Workplace Forms with Lotus Notes and Domino:

- Scenario 1 - Web client (browser) access plus Workplace Forms Viewer as browser plug-in use case
- Scenario 2 - Notes client access plus Workplace Forms Viewer use cases (three different implementations of the scenario are demonstrated)
- Scenario 3 - Notes client access plus Zero Footprint Forms (using Webform Server) use case

9.2 Overview and objective of Domino integration

In comparison with the J2EE/DB2-based scenario described in the earlier chapters, no other systems are involved here (as long as we do not need the Webform Server to render XFDL pages for a Zero Footprint client). Domino serves the following purposes:

- Template storage
- Data storage for employee/product/customer data
- Data storage for submitted requests and extracted data
- Application server
- HTML server to communicate with the client plug-in
- XForms submission service for the Web services used in the form

Recreation of the complete application, including a high standard user interface, is not the goal of this scenario. Instead, we show integration techniques with the Domino environment, based on the same form used in the base J2EE integration scenario.

Accordingly, the main focus in this chapter is on the following topics:

- Show all features used in the J2EE environment, using a completely different application server and back-end storage (prepopulation, XForms submissions, form storage, data extraction).
- Use the unchanged form created for the J2EE scenario in stage 2 and provide necessary adaptations to the Domino environment during form instantiation.
- Show new techniques for data prepopulation and data retrieval.
- Make the scenario almost independent from the used XFDL form. The goal is to define form-specific behavior as configuration parameters related to the provided form.
- Utilize the offline capabilities of the Notes Client in use cases based on a disconnected form handling.

Second level features (in terms of Forms integration) such as development of the implemented business logic in the J2EE stage 2 chapter, high-end UI design, and full navigation facilities in the application are supported in a limited way only. These features depend highly on building the real application, and have to be remade for each project using the available Domino developer skills.

Figure 9-1 illustrates the sample application within the context of a 3-tier architecture. The section outlined with a dashed line illustrates the focus of this integration scenario.

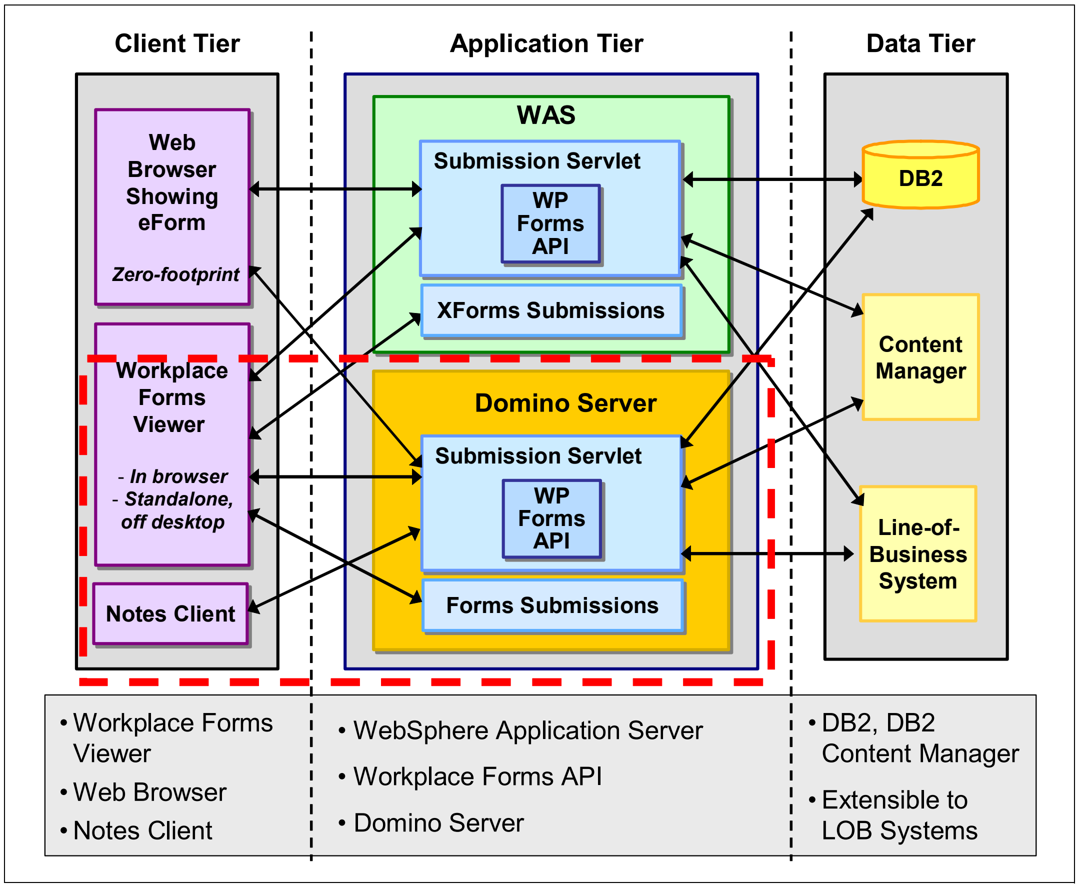


Figure 9-1 Illustrating the focus of this integration scenario

9.3 Environment overview

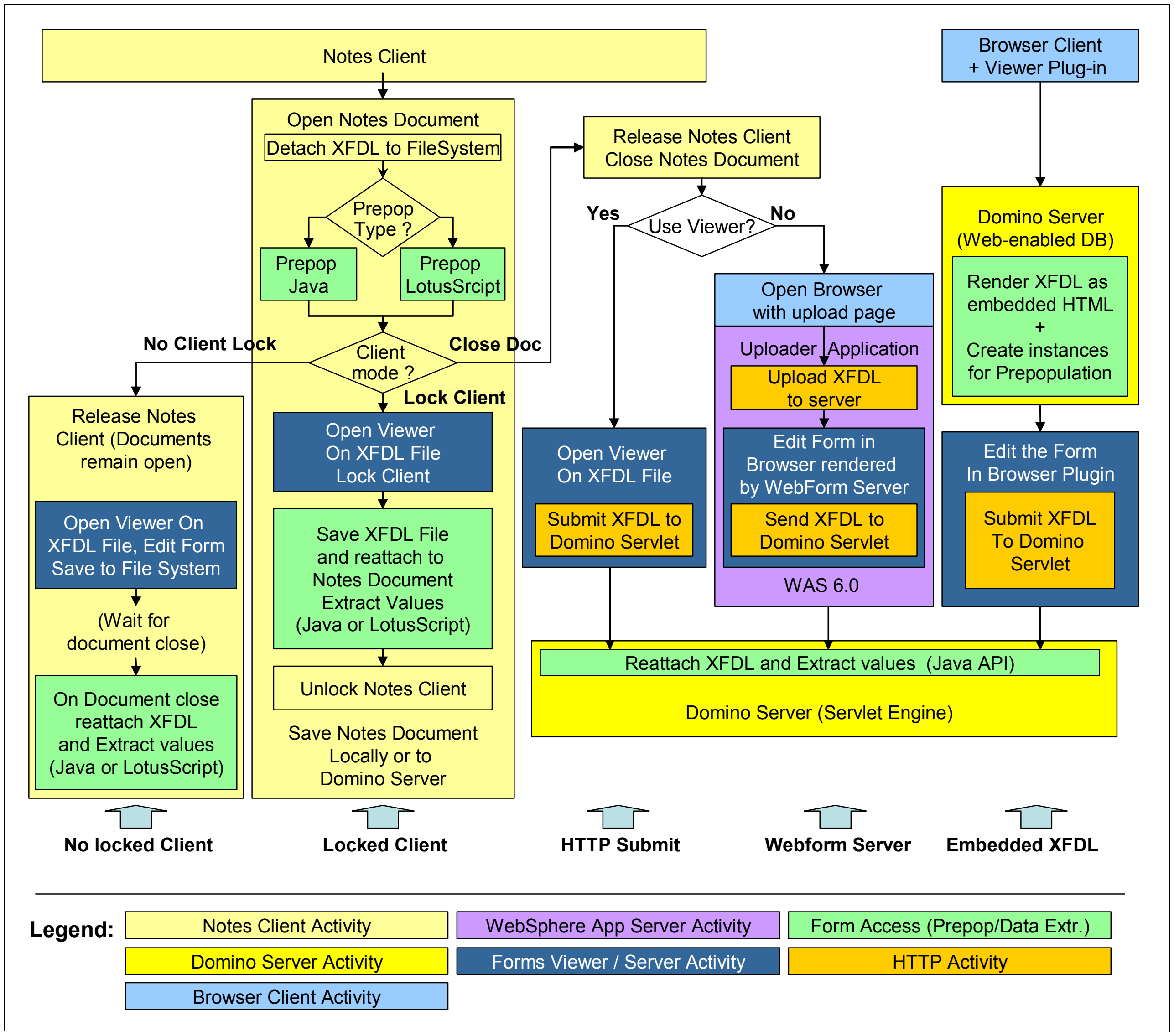
For Domino integration, we set up an application based on two Domino databases. One database contains the Workplace Forms templates (template database) and stores submitted forms and extracted metadata. This database contains the application UI that the end user accesses with the browser. The other database (repository database) serves as a back-end store for all other data such as customer list, employee data, and product catalog.

The template database serves as a Web-enabled application for a browser client and, in scenarios 2 and 3, as an application accessed with the Notes client. If you are working locally, both databases must reside in the data directory of the Notes client using the same path as on the server environment.

Because of the wide range of possible integration scenarios with Domino, we should first explore the different aspects of the integration. To substantiate theoretical considerations about possible use cases and their consequences for the end user experience working on the

Notes client, we build several different use cases, all bundled in the same application. They are mainly using common helper routines for the basic processing tasks during a Forms editing life cycle, but in certain places the information flow differs, using alternative code structures for the same task (for example, LotusScript or Java and Forms API to access the form) or to change application behavior for the end user.

Figure 9-2 shows the variations that can be explored with the available environment.



Notes Client
Browser Client + Viewer Plug-in
Open Notes Document
Detach XFDL to FileSystem
Prepop Type ?
Prepop Java
Prepop LotusSrcipt
Release Notes Client Close Notes Document
Yes
Use Viewer?
No
Domino Server (Web-enabled DB)
Render XFDL as embedded HTML + Create instances for Prepopulation
Open Browser with upload page
Uploader Application
Upload XFDL to server
No Client Lock
Client mode ?
Close Doc
Lock Client
Release Notes Client (Documents remain open)
Open Viewer On XFDL File Lock Client
Open Viewer On XFDL File
Submit XFDL to Domino Servlet
Edit Form in Browser rendered by WebForm Server
Send XFDL to Domino Servlet
WAS 6.0
Edit the Form In Browser Plugin
Submit XFDL To Domino Servlet
Open Viewer On XFDL File, Edit Form Save to File System
(Wait for document close)
On Document close reattach XFDL and Extract values (Java or LotusScript)
Save XFDL File and reattach to Notes Document Extract Values (Java or LotusScript)
Unlock Notes Client
Save Notes Document Locally or to Domino Server
Reattach XFDL and Extract values (Java API)
Domino Server (Servlet Engine)
No locked Client
Locked Client
HTTP Submit
Webform Server
Embedded XFDL
Legend:
Notes Client Activity
WebSphere App Server Activity
Form Access (Prepop/Data Extr.)
Domino Server Activity
Forms Viewer / Server Activity
HTTP Activity
Browser Client Activity

Figure 9-2 Complete Domino environment use case overview

The top line of the diagram shows the end user client type. This client is used to work with the Forms application. The application provides lists of Forms templates and filled forms in the workflow and allows the creation of new forms from a selected template or the opening of existing forms to work with them, for example, in a workflow application.

Below the top line in the diagram, you can see five columns that show the data flow and user interaction for the different use cases. Each use case makes up one column. We put the name of the use case at the bottom of the diagram. Commonly used modules such as the Domino servlet engine are shown in multiple columns. Each column corresponds to a scenario that is presented in this chapter:

- No locked client column - discussed in scenario 2, use cases 2.2 and 2.3
- Locked client column - discussed in scenario 2, use cases 2.1 and 2.3
- HTTP Submit column - discussed in scenario 3, use case 3.1
- Webform Server column - discussed in scenario 3, use case 3.2
- Embedded XFDL column - discussed in scenario 1

The different colors, as shown in the legend at the bottom of the diagram on Figure 9-2 on page 497, indicate the different software components (clients, servers) used to process the different tasks during the life cycle of a Forms editing process. The green boxes show when we are interacting with Forms-relevant data. All of the other components are for some reason necessary to run the application in each of the use cases, but they do not contain Forms-relevant code.

Before building this complex environment, let us look at the most relevant decision points at a glance. You can find in the diagram the following decision points:

- Client type to work with the application
  - Notes client - for the Notes clients as covered in scenarios 2 and 3.
  - Web browser - For this client type, we show only one solid implementation, which is covered in scenario 1. Nevertheless, we could create here the same amount of different use cases.
- Prepopulation and data extraction type (inside the Notes Client flow - Box Prepop Type?)
  - Prepopulation using LotusScript (no Forms API involved)
  - Prepopulation using Java API (We assume, for data extraction, that we use the same technique to have consistent use cases.)
- Behavior of the Notes Client after opening a form (inside the Notes Client flow - Box Client Mode?)
  - Locked client - We force the end user to finish the work in the form and close the Viewer before he can close the related Notes document or access any other function in the Notes client.
  - No locked client - The end user can, after opening an form, use the Notes client and utilize any other Notes client functionality. The opened document remains open until the user closes it.
  - Close Doc - The document is closed immediately after opening the contained form in the Viewer. The end user can use the Notes client and utilize any other Notes functionality.
- Decision about the rendering engine used for the work in the form (Box Use Viewer?)
  - Use the Forms Viewer - The Viewer opens up then as a standalone application, not as a browser plug-in.
  - Use Webform Server - To utilize this, we compose a generic supporting Web application handling the file upload from the client, the browse intersection with Webform server, and the final submission to the Domino servlet.

In this chapter we first create the backbone of the application starting with the browser-based use case (named Embedded XFDL in Figure 9-2 on page 497) and then adding, step by step, more functionality to implement the other use cases.

A diagram of this basic scenario is shown in Figure 9-3.

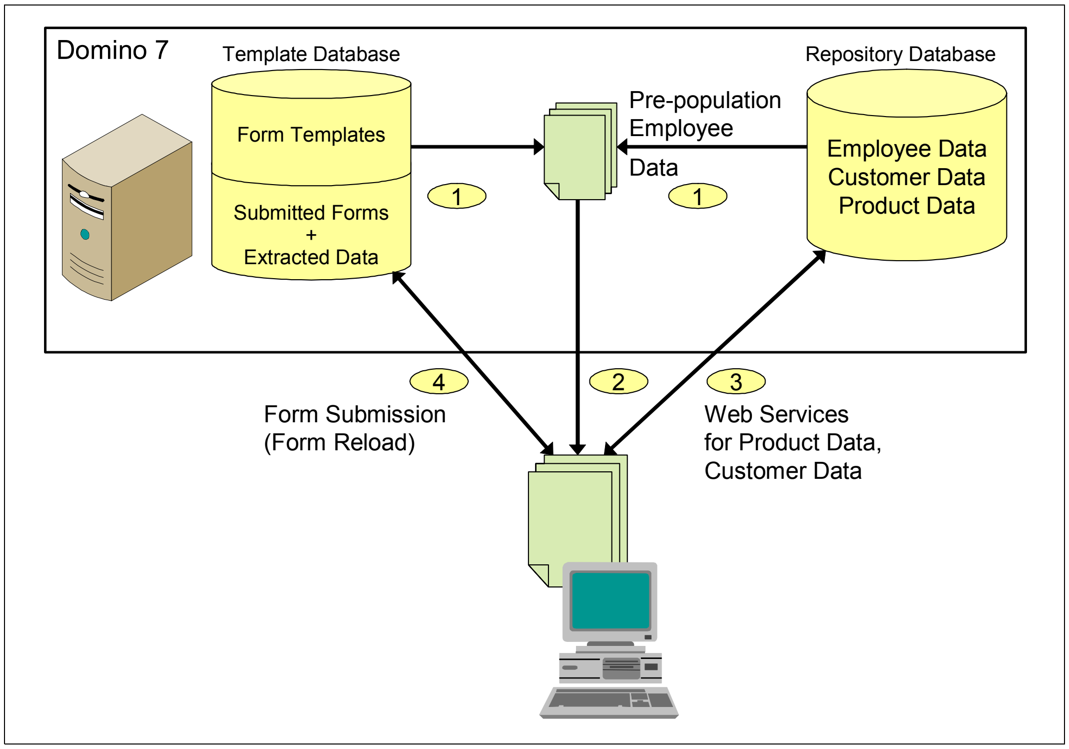


Figure 9-3 Basic usage scenario for Domino integration

The end user opens the template database with the browser and can navigate through available views showing links to different XFDL forms (templates, submitted forms for manager or director approval, approved forms, and canceled forms) similar to the J2EE stage 1 scenario, described in Chapter 5, “Building the base scenario: stage 1” on page 173. Accessing this database, the user has to authenticate against the Domino Directory.

Creating a new form from a chosen template, the Domino server gathers the employee data based on the user name and prepares this data along with the new order number and the template form for client download.

The XFDL form (as in the J2EE scenario described in Chapter 6, “Building the base scenario: stage 2” on page 367) reads product and customer data using an XForms submission service. However, in this chapter, the service runs against a LotusScript agent on the Domino server, not a J2EE application.

The client submits the form to the Domino server. The server extracts the desired metadata and stores the form and metadata in a Notes document. This document (metadata and stored form) is updated whenever the contained form is re-opened and re-submitted.

This chapter does not contain all of the detailed information necessary to recreate the integration environment. Rather, we refer to the available building blocks and discuss relevant topics.

Full application design and sample data is available in Appendix D, “Additional material” on page 693.

The following new integration techniques are discussed in this chapter:

- Embedding the XFDL form into an HTML page
- Prepopulation using a script in an HTML page
- Prepopulation using text parsing
- Data extraction using API based on entire data instances, not single fields

Attention: Using text parsing to interact with the form is a very powerful method because there are nearly no restrictions to the available operations, like having appropriate navigation/data access methods offered by API or setting up correct namespaces to access specific data. Nevertheless, there are some considerations to make before using text parsing:

- Be aware of the compression state of the form. You may have to uncompress the form before you can access it. XFDL uses base64-gzip encoded compression. The Forms API does compressing/uncompressing in a transparent mode.
- It is easy to break a form using text parsing when inserting restricted characters.
- It is easy to break signatures written back to the form. Using the Forms API does not allow a change to signed data or structures.
- It is very difficult to verify signatures when not using the Forms API.

After setting up the system, we discuss the development tasks.

9.4 Setting up the Domino environment

The Domino environment is set up in a standard way. We do not describe these steps in detail. Make sure that the following environment is available:

- Domino Server Version 7.0 or later
- Servlet support enabled (Domino Servlet Manager) in Domino Directory/server document
- Tasks running: HTTP, Indexer
- Workplace Forms API installed
- Basic authentication enabled on the server (not session authentication)

Make sure that you have registered the deployed Workplace Forms API jar files in server notes.ini and the developer client like this:

```
JavaUserClasses=[System32]\PureEdge\70\java\classes\pe_api.jar;[System32]\PureEdge
\70\java\classes\uwi_api.jar
```

Using the databases from the Redbooks repository, deploy both databases to the server in the forms directory:

- forms/WPForms.nsf (Title - WPForms Templates)
- forms/WPFormsRep.nsf (Title - Repository DB)

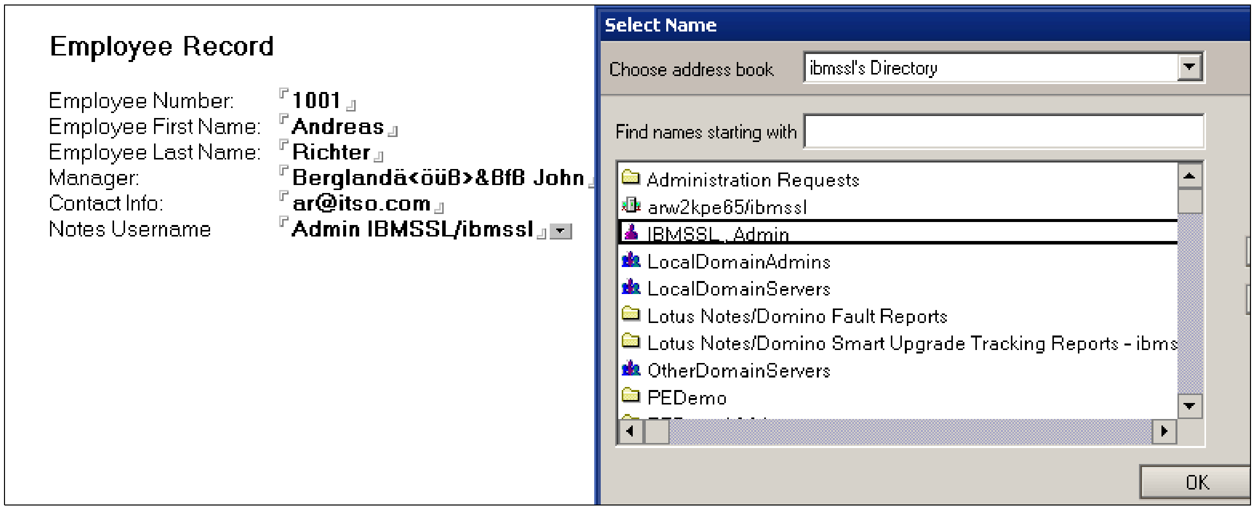
Sign both databases with an administration ID able to run unrestricted agents and Web services on the server. The ID should have manager rights in the ACL of both databases.

Apply the ACL settings listed in Table 9-1 to both databases.

Table 9-1 ACL settings for Domino integration

Database	User/group	ACL settings
Template database	Default	Author
	Anonymous	No Access (This will require user authentication.)
Repository database	Default	Reader
	Anonymous	Reader (necessary for Web service or XForms submission access to the data)

To make user authentication match with the available employee data, open the repository database and edit/create users. Ensure that the Notes Username field is populated with a valid user name from the Domino Directory, as shown in Figure 9-4.


Employee Record

Employee Number:	1001
Employee First Name:	Andreas
Employee Last Name:	Richter
Manager:	Berglandä<öüß>&ßfß John
Contact Info:	ar@itso.com
Notes Username	Admin IBMSSL/ibmssl

Figure 9-4 Assign valid Notes user names to the employees

After completing the form and view design in the repository database, create sample data to populate the database from scratch.

9.5 Foundation of Domino development

There are several parts to create for Domino integration. In this section we describe how to build the relevant parts necessary as a foundation for all of the integration scenarios. We use Notes @Formula, LotusScript, and Java languages to create all the necessary code. The development phase contains the following tasks:

- Creating the necessary static forms and views
- Creating the XFDLRendering form used to process data prepopulation
- Creating a servlet that will receive the submitted form (extract data and store form and data)
- Creating dedicated views with links, creating new documents from the template, or opening existing XFDL forms

- Providing XForms submissions needed to supply the product and customer data

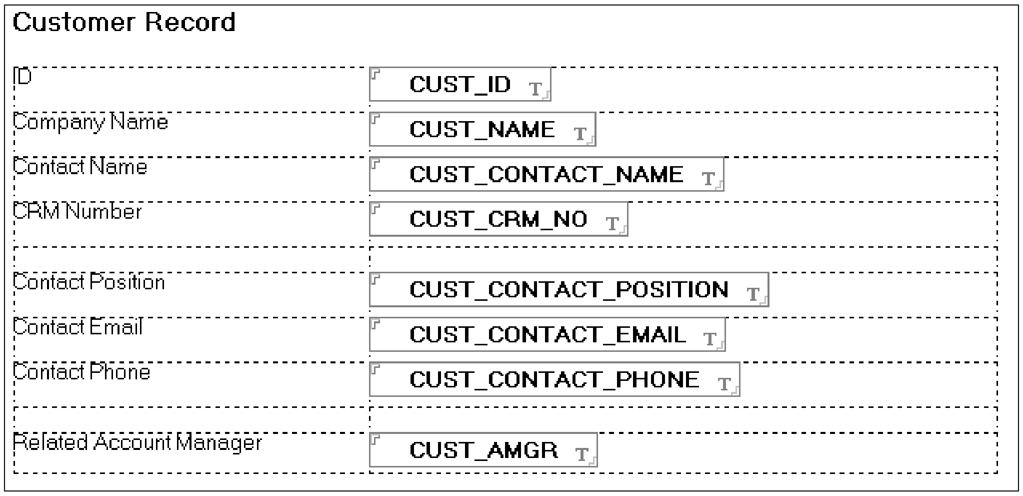
A main guideline for this chapter is to not write code related to a specific form. Instead, we write code that processes a whole class of templates, which is then parameterized to the needs of a specific form. This is valid for the modules that create forms from templates (and prepopulate them with data) and receive submitted forms for data retrieval and data storage.

9.5.1 Repository database

The repository database contains some external data that we access (read) while creating forms or working on forms. There is no sophisticated logic in the database. We compose a few forms to store the data (employees, customers, and items) and some views to list them for lookup purposes.

Domino forms

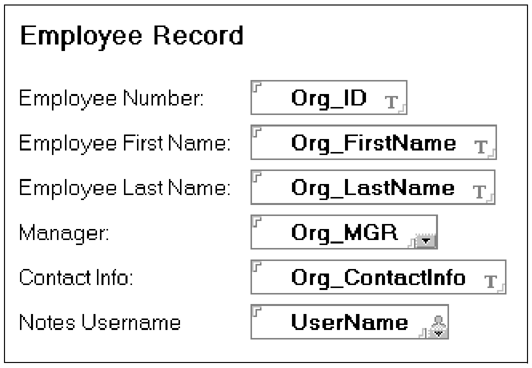
All Domino forms used in the repository database (employee data, customer data, and product data) are simple. They store the necessary fields for each data type in the corresponding form. The only relevant field is the Notes Username field in the Employee form. This field is a Names field that picks up user names from the Domino Directory. It needs to be stored in a fully cannonicalized format (such as CN=Andreas® Richter/OU=DEP12/O=ACME) to match the user name available in the session when the user authenticates. Some samples for form design (make sure to match the form name and the field names in your application) are shown in Figure 9-5, Figure 9-6 on page 503, and Figure 9-7 on page 503.



Customer Record

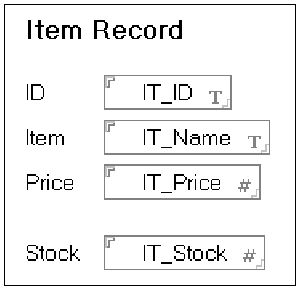
ID	CUST_ID
Company Name	CUST_NAME
Contact Name	CUST_CONTACT_NAME
CRM Number	CUST_CRM_NO
Contact Position	CUST_CONTACT_POSITION
Contact Email	CUST_CONTACT_EMAIL
Contact Phone	CUST_CONTACT_PHONE
Related Account Manager	CUST_AMGR

Figure 9-5 Customer form


Employee Record

Employee Number:	Org_ID
Employee First Name:	Org_FirstName
Employee Last Name:	Org_LastName
Manager:	Org_MGR
Contact Info:	Org_ContactInfo
Notes Username	UserName

Figure 9-6 Employee form


Item Record

ID	IT_ID
Item	IT_Name
Price	IT_Price
Stock	IT_Stock

Figure 9-7 Item form

Views

Corresponding maintenance views are created for each form. Each view is sorted by the corresponding ID field on the form. These views are used for the Web services to look up detailed data. In addition, one lookup view for employee data sorted by name is created using the following view selection formula:

```
View (luEmployeesByNotesName) sorted by the Notes Username field, second column
shows @Text(@DocumentUniqueID)
```

9.5.2 XForms submissions

There are potentially four XForms submissions identified in the form (see Table 6-11 on page 413) that we must implement (customer list and detail data and product catalog list and detail data). Due to the decision to call all of the submissions using the same URL on the host (and differentiate the operation to execute by exploring the URL parameters and the POST data stream), we must compose a single design element. The implementation could be one of the following:

- Implementation as a servlet
- Implementation as a Java-based Web agent
- Implementation as a LotusScript-based Web agent

To keep things easy for Domino developers that are conversant in LotusScript, we do the implementation using LotusScript.

Attention: Taking this decision, you should consider the following aspects:

- Expecting large request messages containing more than 28 Kbyte, the development of a servlet is mandatory. (The CGI variable implementation for LotusScript and Java agents will cut the message after 30.000 characters.)
- If you are not sure that the service will eventually run on a Domino server, it may be a good choice to write a servlet.
- If you need specialized interfaces to the back-end, such as database drivers, the available (and approved) software can have a significant impact to your decision.

First we look at the message structure that the already designed XForms submission in the form will serve. Let us repeat here the assumptions made for the submission design (which is taken from Chapter 6, "Building the base scenario: stage 2" on page 367):

- The component must be able to detect URL arguments exploring the request URL.

Example 9-1 XForms submission URL requesting detail data for an inventory item

```
http://vmforms261.cam.itso.ibm.com:10000/WPForms261RedbookXForms/XFormsSubmissionS
ervlet?action=getDetails&instanceID=InventoryItemDetails
```

- We require parameter detection exploring the POST data stream.

Example 9-2 XForms submission POST data containing an additional selection data (Item ID)(

```
<InventoryItemID xmlns="" xmlns:custom="http://www.ibm.com/xmlns/prod/XFDL/Custom"
xmlns:designer="http://www.ibm.com/xmlns/prod/workplace/forms/designer/2.6"
xmlns:ev="http://www.w3.org/2001/xml-events"
xmlns:xfdl="http://www.ibm.com/xmlns/prod/XFDL/7.0"
xmlns:xforms="http://www.w3.org/2002/xforms"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
Nut[IT_001]
</InventoryItemID>
```

The response messages must exactly map the data structure of the target instances to update. See Example 9-3.

Example 9-3 XForms submission response delivering the detail data for the requested item

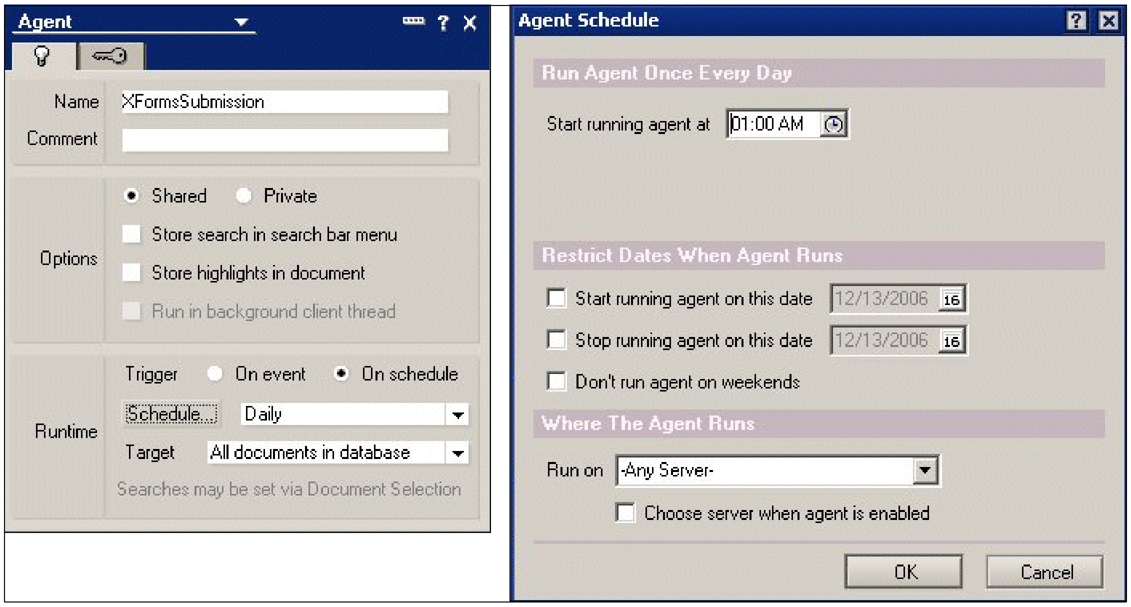
```
<InventoryItemDetails>
   <Item>
      <ID>IT_001</ID>
      <Name>Nut</Name>
      <Price>21.15</Price>
      <NumberInStock>11111</NumberInStock>
   </Item>
</InventoryItemDetails>
```

There are many ways to create XML structures in LotusScript. We use a straightforward approach, composing these structures using pure LotusScript with no XML parsers. In our scenario, this seems to be the best choice, since we can inspect exactly what we are doing and we do not have to struggle with any limitations of XML parsers.

9.5.3 Creating an XForms submission agent

The following steps illustrate how we create a LotusScript agent in the repository database named XFormsSubmission running as a Web agent.

1. Open the database in Domino Designer. Go to the Shared Code/Agents pane, and click the **New Agent** button.
2. Select the **On schedule** radio button as the trigger, and click the **Schedule...** button.
3. Change the target server to **Any Server**, as shown in Figure 9-8, and click **OK**.


Agent

Name: XFormsSubmission
Comment:

Options: Shared [✓] / Private; Store search in search bar menu; Store highlights in document; Run in background client thread

Runtime: Trigger: On event / On schedule [✓]; Schedule...: Daily; Target: All documents in database

Searches may be set via Document Selection

Agent Schedule

Run Agent Once Every Day

Start running agent at 01:00 AM

Restrict Dates When Agent Runs

Start running agent on this date 12/13/2006

Stop running agent on this date 12/13/2006

Don't run agent on weekends

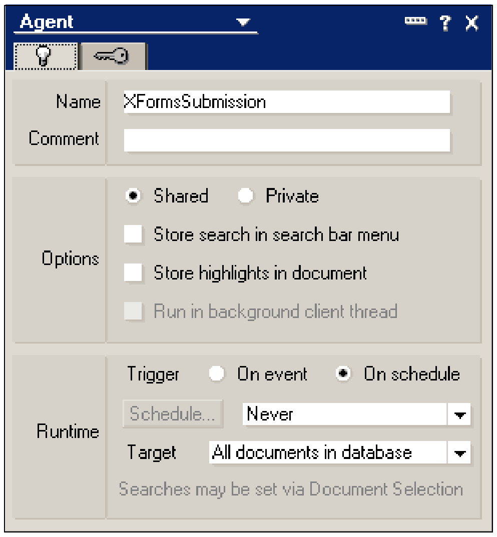
Where The Agent Runs

Run on -Any Server-

Choose server when agent is enabled

Figure 9-8 Create the agent as scheduled running on any server

4. Switch the agent schedule property to **Never** and name the agent **XFormsSubmission**, as shown in Figure 9-9.
5. Click **OK**, and on the Action pane select **LotusScript** from the drop-down list. Save the agent.


Agent

Name: XFormsSubmission
Comment:

Options: Shared [✓] / Private; Store search in search bar menu; Store highlights in document; Run in background client thread

Runtime: Trigger: On event / On schedule [✓]; Schedule...: Never; Target: All documents in database

Searches may be set via Document Selection

Figure 9-9 Final agent settings as running on schedule/never

6. Apply the basic options and the skeleton code, as shown in Example 9-4. The code reads the necessary CGI variables and extracts the URL parameters. At the end of the code we find the print statements that submit the prepared XML back to the form.

Example 9-4 XFormsSubmission agent skeleton code

```
Sub Initialize

   On Error Goto Errorhandler
   Dim session As New NotesSession

   Dim db As NotesDatabase
   Dim doc As NotesDocument 'context doc containing the CGI variables

   Dim argsV As Variant'url params as Variant
   Dim args List As String 'url params as list
   Dim request As String'post data from incoming request
   Dim xFormsInstance As String ' post data with the prepared XML
         'Instance to be returned


   'drill down to the context document storing the CGI variables for
         'URL parameters and POST data
   Set db = session.CurrentDatabase
   Set doc = session.DocumentContext

   'define some default values for the url parameters that we will care about:
   args("instanceID") = "data"
   args("action") = "no action provided"

   'read all URL parameters into an array
   argsV = Split(doc.Query_String_decoded(0), "&")
   Forall a In argsV
      If Instr(a, "=") > 0 Then
         args(Strleft(a, "=")) = Strright(a, "=")
      End If
   End Forall
   'read incoming POST data
   request = doc.Request_Content(0)

   'process
   '*******************************************************************
   '*** here goes our code to create - BEGIN
   '*******************************************************************

   xFormsInstance = "<TEST></TEST>"

   '*******************************************************************
   '*** here goes our code to create - END
   '*******************************************************************

   'return the instance data - set content type and submit it
   Print "Content-type: text/xml"
   Print xFormsInstance

   Exit Sub
```

```
Errorhandler:
   Messagebox "Error " & Err() & " in " & Lsi_info(2) & " at line " & Erl() & 
Chr$(10) & Error$
   Print "Content-type: text/xml"
   Print "<errors>Errors processing this request</errors>"

End Sub
```

> **Restriction:** Be aware that the provided code can only read and write small amounts of POST data (maximum of 30 KByte).
>
> For reading larger POST data streams, we should develop a servlet. Servlets running on Domino can consume data steams with no restrictions in size.
>
> To send back larger data streams, split the complete XML into smaller sections and submit them sequentially as chunks. For more details about chunks, see the section in this chapter that discusses using them when creating the embedded XFDL form.

7. Compose two helper functions inside the agent. These helper functions compose XML elements from a defined name and content or extract the content from a given XML element (stripping the surrounding start and end tags).

Example 9-5 Helper functions to create and read XML fragments

```
Function getXMLElement (elementName As String, XML As String) As String

   'return the content of the first xml element defined by the element name
   'content may be any inner XML or data only

   On Error Goto Errorhandler
   Dim strtmp As String
   If Instr(XML, "<" + elementName + ">" ) > 0 Then
      'element without attributes as <name>....</name>
      strTmp = Strleft(XML,  "</" + elementName + ">")
      strTmp = Strright(strTmp,  "<" + elementName + ">")
      getXMLElement = strtmp
   Elseif  Instr(XML, "<" + elementName + " " ) > 0 Then
      'element with attributes as <name id='xxx">....</name>
      strTmp = Strleft(XML,  "</" + elementName + ">")
      strTmp = Strright(strTmp,  "<" + elementName + " ")
      strTmp = Strright(strTmp,  ">" )
      getXMLElement = strtmp
   Else
      getXMLElement = ""
   End If
   Exit Function
Errorhandler:
   Messagebox "Error " & Err() & " in " & Lsi_info(2) & " at line " & Erl() & 
Chr$(10) & Error$

End Function

Function  createXMLElement(elementName As String, content As String, attributes As 
String) As String
   'create an XML fragment like
   '<element attributes ...> content</element>

   On Error Goto Errorhandler
   Dim strTmp As String

   strTmp =  "<" + elementName
   If attributes <> "" Then
      strTmp = strTmp + " " + attributes
   End If
   strTmp = strTmp + ">" + content + "</" + elementName + ">"
   createXMLElement = strTmp + Chr$(10)

   Exit Function
Errorhandler:
   Messagebox "Error " & Err() & " in " & Lsi_info(2) & " at line " & Erl() &
Chr$(10) & Error$

End Function
```

8. Having the skeleton code in place, we can start to code the logic that handles the processing in the agent. In the marked section of the servlet skeleton, the main application logic should detect the different request types (compare with Table 6-11 on page 413). Table 9-2 lists the types we provide in our form.

Table 9-2 Request types to serve in XFormsSubmission agent

Action parameter	submissionID	Request parameters	Results

getChoices	InventoryItems	none (return all item IDs)	<InventoryItems>
			  <InventoryItem>Nut[IT_001]</InventoryItem>
			  <InventoryItem>Bolt[IT_002]</InventoryItem>
			  <InventoryItem>Widget[IT_003]</InventoryItem>
			  <InventoryItem>Gadget[IT_004]</InventoryItem>
			  <InventoryItem>Thingy[IT_005]</InventoryItem>
			  </InventoryItems>

getChoices	CustomerIDs	none (return all customer IDs)	<CustomerIDs> <CustomerID>OnDemand Corporation[100000] </CustomerID> <CustomerID>Workplace Early Adopter Inc[100001] </CustomerID> <CustomerID>Portal Application Surfacing[100002] </CustomerID> <CustomerID>Workplace Forms Redpapers Inc[100003] </CustomerID> <CustomerID>Mobile Devices Corporation[100005] </CustomerID> </CustomerIDs>

Action parameter	submissionID	Request parameters	Results
getDetails	InventoryItem Details	<InventoryItemID ... >ID</InventoryItemID>	<InventoryItemDetails> <Item> <ID>IT_001</ID> <Name>Nut</Name> <Price>21.15</Price> <NumberInStock>11111 </NumberInStock> </Item> </InventoryItemDetails>
getDetails	CustomerDetai ls	<ID .... >CustomerID</ID>	<CustomerDetails> <Customer> <ID>123</ID> <Company>CompName</Company> <AccountManagerID>N</AccountManagerID> <Department>Dep</Department> <ContactName>CN</ContactName> <ContactPosition>PC</ContactPosition> <ContactEmail>CE</ContactEmail> <ContactPhone>CP</ContactPhone> <CRMNumber>CR#</CRMNumber> </Customer> </CustomerDetails>

The code evaluating the request URL identifies the different request types and exposes the places to insert the request-specific code. Since we have two main types (get lists and get details), we expect to have some really request-specific code and some common code to process for each request class. The code should look like Example 9-6.

Example 9-6 Code skeleton that creates the structure for data processing

```
   'process
   '*******************************************************************
   '*** here goes our code to create - BEGIN
   '*******************************************************************
   Dim instanceID As String

   'get the instanceElement name
   instanceID = args("instanceID")
   'first - determine the action
   Select Case args("action")
   Case "getChoices" 'we will return complete list of all available objects
(formatted as string: name [id])
      'select the corresponding view  and return structure
      Select Case instanceID
      Case "CustomerIDs"
         'insert here the settings for customer list retrieval

      Case "InventoryItems"
         'insert here the settings for item list retrieval

      End Select
      'process the list request - get the view and read all entries

   Case "getDetails" 'we will return detailed object date for one object
```

```
                  ’specified by the key
      Select Case instanceID
      'select the corresponding view  and return structure and create the
                  ’inner XML
      Case "CustomerDetails"
         'insert here the settings for customer detail data  retrieval

      Case "InventoryItemDetails"
         'insert here the settings for item detail data  retrieval

      End Select
      'complete the detail request

   Case Else
      Print "Please use this method only with the parameter action=getDetails or
action=getChoices"
      Exit Sub

   End Select

   '*******************************************************************
   '*** here goes our code to create - END
   '*******************************************************************
```

9. Complete the data-gathering code snippets. For each request type, we have do the following steps:
   a. Define the view for the data lookup.
   b. Define the key for data lookup. (This is necessary for detail data requests only.)
   c. Retrieve the data.
   d. Create an XML structure based on the data and the required tag names for the data instance.
   e. Finalize the response message (this can be done in some common code lines for all methods).

   The complete processing code for the list requests looks like Example 9-7.

Example 9-7 Code stream to compose choices lists XML structure

```
   Case "getChoices" 'we will return complete list of all available objects
(formatted as string: name [id])
      'select the corresponding view  and return structure
      Select Case instanceID
      Case "CustomerIDs"
         'insert here the settings for customer list retrieval
         Set view = db.GetView("Customers")
         instanceElement =""   'no input necessary here
         elementName = "CustomerID"
      Case "InventoryItems"
         'insert here the settings for item list retrieval
         Set view = db.GetView("Items")
         instanceElement =""    'no input necessary here
         elementName = "InventoryItem"
      End Select
      'process the request - get the view and read all entries
      'compose for each found document an entry containing the
      'name and the id as this: name [id]
      Set entrycollection = view.allentries
      Set entry = entrycollection.GetFirstEntry
      For ec=0 To (entrycollection.count -1)
         'instanceData= instanceData +  createXMLElement(elementName,
            entry.ColumnValues(1) + { [} + entry.ColumnValues(0)+ {]}, {id="} +
            entry.ColumnValues(1) + { [} + entry.ColumnValues(0)+ {]" })
         instanceData= instanceData +  createXMLElement(elementName,
            entry.ColumnValues(1) + { [} + entry.ColumnValues(0)+ {]}, {})
         Set entry = entrycollection.GetNextEntry(entry)
      Next
      'attach the envelope (apply the instance id as sourrounding xml element)
      xFormsInstance = createXMLElement(instanceID, Chr$(10) + instanceData +
Chr$(10) , "")
```

For the customer detail data, the corresponding code is more complex, as shown in Example 9-8.

Example 9-8 Code stream to compose customer detail data XML structure

```
      Select Case instanceID
      'select the corresponding view  and return structure and create the inner
XML
      Case "CustomerDetails"
         'insert here the settings for customer detail data  retrieval
         Set view = db.GetView("Customers")
         instanceElement ="Customer"
         'obtain  the key from the request
         key = getXMLElement("CustomerID", request)
         If Instr(key, "[") > 0 And  Instr(key, "]") > 0 Then key =
Strright(Strleft(key, "]"), "[")

         'select the document and create the inner XML
         Set  targetDoc = view.GetDocumentByKey(key, True)
         instanceData= instanceData + createXMLElement("ID",
            targetDoc.getItemValue("cust_id")(0), "")
         instanceData= instanceData + createXMLElement("Company",
            targetDoc.getItemValue("cust_name")(0), "")
         instanceData= instanceData + createXMLElement("Department",
            "not available", "")
         instanceData= instanceData + createXMLElement("AccountManagerID",
            targetDoc.getItemValue("cust_amgr")(0), "")
         instanceData= instanceData + createXMLElement("ContactName",
            targetDoc.getItemValue("cust_contact_name")(0), "")
         instanceData= instanceData + createXMLElement("ContactPosition",
            targetDoc.getItemValue("cust_contact_position")(0), "")
         instanceData= instanceData + createXMLElement("ContactPhone",
            targetDoc.getItemValue("cust_contact_phone")(0), "")
         instanceData= instanceData + createXMLElement("ContactEmail",
            targetDoc.getItemValue("cust_contact_email")(0), "")
         instanceData= instanceData + createXMLElement("CRMNumber",
            targetDoc.getItemValue("cust_crm_no")(0), "")
      Case "InventoryItemDetails"
```

```
.......
      End Select

      'attach the envelope
      xFormsInstance = createXMLElement(instanceID,
Chr$(10)+createXMLElement(instanceElement , Chr$(10) + instanceData + Chr$(10),
""), "")
```

10. We now have to map the internal names of the data source to the required names of the elements in the XForms submission. This mapping always takes place. Even if we are able to design a data model in the form using identical element names as in the data source, just a simple switch of the data back end to another system (as SAP or DB2) would force the introduction of some mapping later on. With regards to this, a production-ready solution should offer a solution to change this mapping with minimal effort (for example, reading the mapping from some global variables, from a database or profile documents).

    Look at the code stream for item detail data, as shown in Example 9-9, which shows the mapping.

Example 9-9 Code stream to create customer detail data XML structure

```
      Case "InventoryItemDetails"
         'insert here the settings for item detail data  retrieval
         Set view = db.GetView("Items")
         instanceElement ="Item"
         'obtain  the key from the request
         key = getXMLElement("InventoryItemID", request)
         If Instr(key, "[") > 0 And  Instr(key, "]") > 0 Then key =
Strright(Strleft(key, "]"), "[")

         'select the document and create the inner XML
         If key = "" Then key = "IT_001"
         Set  targetDoc = view.GetDocumentByKey(key, True)
         instanceData= instanceData + createXMLElement("ID",
targetDoc.getItemValue("it_id")(0), "")
         instanceData= instanceData + createXMLElement("Name",
targetDoc.getItemValue("it_name")(0), "")
         instanceData= instanceData + createXMLElement("Price",
targetDoc.getItemValue("it_price")(0), "")
         instanceData= instanceData + createXMLElement("NumberInStock",
targetDoc.getItemValue("it_stock")(0), "")
      End Select

      'attach the envelope
      xFormsInstance = createXMLElement(instanceID,
Chr$(10)+createXMLElement(instanceElement , Chr$(10) + instanceData + Chr$(10),
""), "")
   Case Else
........
```

11. Save the agent and have a quick test using the prepared stage 2 form.

The following steps illustrate how we can perform this quick test:

1. Have the Domino server with the HTTP task running and apply the matching URL in the ConfigurationInfo XForms data instance of the form (keep in mind that the compute in the form adds the required parameters after the ending &amp;):

   ```
   http://localhost/forms/WPFormsRep.nsf/XFormsSubmission?OpenAgent&
   ```

2. Open the form in the Preview tab of Forms Designer. The choices lists should show the available item and customers from the database.

Tip: For any debugging tasks, we strongly recommend using an HTTP sniffer tool. You should be able to detect the created URLs, headers, and the POST data to find any errors in the environment.

9.6 Scenario 1 - Domino integration for Web-enabled applications using Forms Viewer browser plug-in

Having created the foundation of our Domino development, we can now start to build the Forms-specific parts for the first scenario.

The template database is accessed by a user using a Web browser client. In Figure 9-10 this is the scenario on the right border highlighted with a red box with broken lines. The user has the Forms Viewer plug-in installed on the browser. A Domino server with an activated HTTP service hosts the created databases and runs a submission servlet to receive the submitted forms.

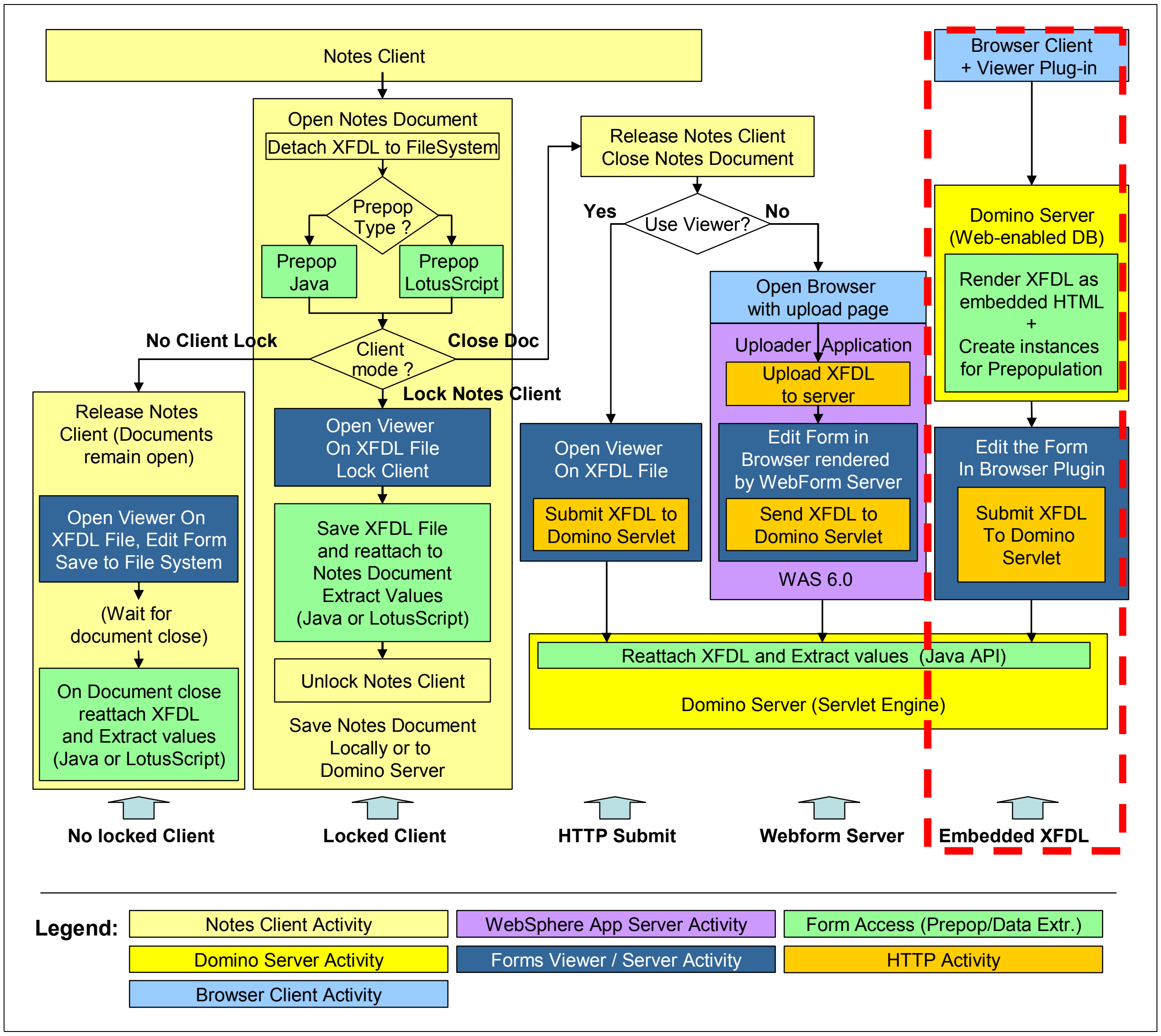

Notes Client
Open Notes Document
Detach XFDL to FileSystem
Prepop Type ?
Prepop Java
Prepop LotusSrcipt
Client mode ?
No Client Lock
Close Doc
Lock Notes Client
Release Notes Client (Documents remain open)
Open Viewer On XFDL File, Edit Form Save to File System
(Wait for document close)
On Document close reattach XFDL and Extract values (Java or LotusScript)
Open Viewer On XFDL File Lock Client
Save XFDL File and reattach to Notes Document Extract Values (Java or LotusScript)
Unlock Notes Client
Save Notes Document Locally or to Domino Server
Release Notes Client Close Notes Document
Use Viewer?
Yes
No
Open Viewer On XFDL File
Submit XFDL to Domino Servlet
Open Browser with upload page
Uploader Application
Upload XFDL to server
Edit Form in Browser rendered by WebForm Server
Send XFDL to Domino Servlet
WAS 6.0
Browser Client + Viewer Plug-in
Domino Server (Web-enabled DB)
Render XFDL as embedded HTML + Create instances for Prepopulation
Edit the Form In Browser Plugin
Submit XFDL To Domino Servlet
Reattach XFDL and Extract values (Java API)
Domino Server (Servlet Engine)
No locked Client
Locked Client
HTTP Submit
Webform Server
Embedded XFDL
Legend:
Notes Client Activity
WebSphere App Server Activity
Form Access (Prepop/Data Extr.)
Domino Server Activity
Forms Viewer / Server Activity
HTTP Activity
Browser Client Activity

Figure 9-10 Domino environment use case overview - building scenario 1 (Viewer plug-in embedded in HTML page)

We start the development by creating a new form in the template database.

9.6.1 Template database: components to create a new form from template

The template database has the role of the application database. It contains several correlated design elements, which work together when creating new forms or opening existing forms in the browser.

For Form creation in the first (browser client based) scenario, we create the following components:

- A Domino form to store templates
- A Domino form to render the HTML page shown to the browser when creating a new request
- An initiation agent that fills in the rendering form
- A view that lists all available forms along with suitable links to compose a new XFDL form from the template
- At least one stored template with prepopulation settings applied to test the created design elements
- A parameter form and view that stores the necessary application parameters (order count, server URL, and so on)
- A LotusScript library to contain all complex functions we use

The database receives submitted forms as well, so we need an additional Domino form to store submitted forms and at least one lookup view to find the related document on subsequent updates to the submitted XFDL documents, for example, those going through the approval workflow. We create all of these components in the next sections.

LotusScript library LibFormsIntegration

To keep the functionality for forms integration as long as possible in one single place, we create a LotusScript library named LibFormsIntegration. All the script code used in our application is stored in this script library. The provided forms contain only a reference to this library in the global form settings and simple function calls to the script library wherever more then two lines of code are needed.

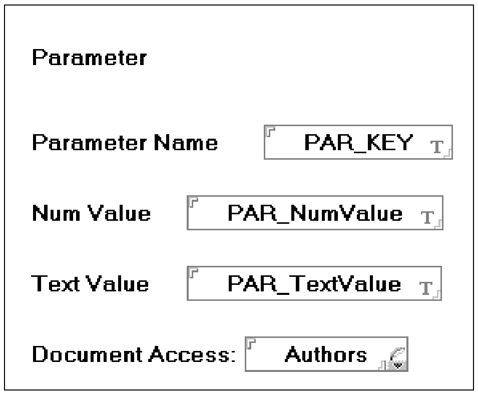
Apply the following instructions in the options of the library:

```
Option Public
Option Declare
```

Save and close the script library. We will return to it many times during the development phase.

Parameter form and view

In this section we create one simple Domino form to store application parameters. We use these documents to store the DNS name of the server, using it to create HTTP links, and we store the order number counter that increments on each new order creation. An additional author field has been added (Figure 9-11).

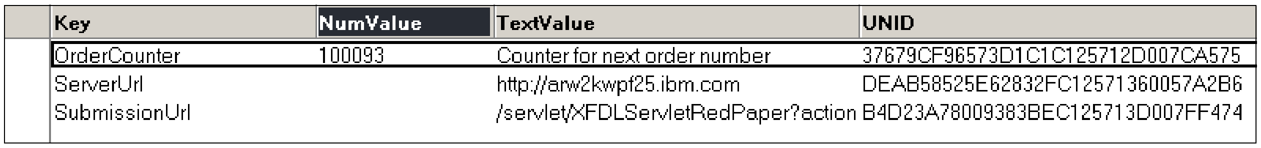


Parameter

Parameter Name	PAR_KEY
Num Value	PAR_NumValue
Text Value	PAR_TextValue
Document Access:	Authors

Figure 9-11 Parameter Form in template database

For lookup and maintenance, create one view sorted by field PAR_KEY (make sure that the fourth column presents the @DocumentUniqueID), as shown in Figure 9-12.

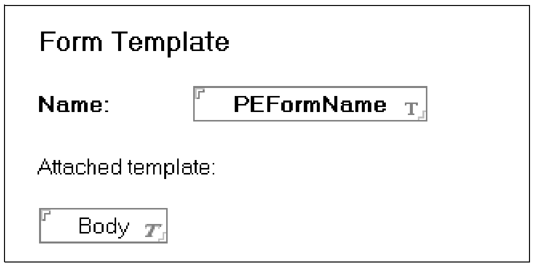


Key	NumValue	TextValue	UNID
OrderCounter	100093	Counter for next order number	37679CF96573D1C1C125712D007CA575
ServerUrl		http://arw2kwpf25.ibm.com	DEAB58525E62832FC12571360057A2B6
SubmissionUrl		/servlet/XFDLServletRedPaper?action	B4D23A78009383BEC125713D007FF474

Figure 9-12 Parameter lookup view

9.6.2 Template form

The template form basically stores the form templates as file attachments in a rich text field. Create a form named FormTemplate, as shown in Figure 9-13.



Form Template

Name: PEFormName

Attached template:

Body

Figure 9-13 Basic fields for template storage

The name field should contain a short name for the template. This is the link text that is presented to the end user when creating a new form from the template.

This form should not only store the form XFDL template, but also contain additional functionality:

- It gets a set of fields used to define any prepopulation applied to the template when creating a new form. This makes it possible to run a generic prepopulation module, and prepopulate a different data set on form initiation.
- It contains the information about the data instance to extract on form submit.

- It needs to provide a converted version of the original XFDL template that can be easily accessed in the prepopulation step.

To convert the attachment, open the PostSave event of the form and insert the code shown in Example 9-10.

Example 9-10 Attachment conversion in the PostSave event

```
Sub Postsave(Source As Notesuidocument)

   'detach the attachment to temp directory and store it back to bodyInline field as mime
type
   Call  client_attachXFDLTemplateInline(source.Document, "Body", "BodyInline")

End Sub
```

Create the called procedure in LibFormsIntegration script library, as shown in Example 9-11.

Example 9-11 Procedure to convert attachments

```
Sub client_attachXFDLTemplateInline(doc As NotesDocument, sourceFieldName As
String, targetFieldName As String)

   'detach the attachment to temp directory and store it back to bodyInline field
as mime

   Dim rtitem As NotesRichTextItem

   Dim filepath As String

   filepath = file_detachXFDLTemplate(doc , sourceFieldName)

   'Read the detached file into inputstream and append to Body richtext field on
rendering form
   Dim stream As NotesStream
   Set stream = session.CreateStream
   If Not stream.Open(filepath, "UTF-8") Then
      Print "Open failed"
      Exit Sub
   Else
      Print  "Opened file " + filepath
   End If
   If stream.Bytes = 0 Then
      Print  "File has no content"
      Exit Sub
   End If

   'clear up when updating
   If doc.HasItem(targetFieldName) Then
      Set rtitem=doc.getfirstItem(targetFieldName)
      Call rtitem.remove
      Set rtitem=doc.CreateRichTextItem(targetFieldName)
   Else
      Set rtitem=doc.CreateRichTextItem(targetFieldName)
   End If
   'store new form
   Call rtitem.appendtext(stream.ReadText())
   Call stream.Close
   Call doc.Save(True, True)

   Kill filepath

End Sub

Function file_detachXFDLTemplate(doc As NotesDocument, fieldname As String) As
String
   'detaches the attachment containg in a rich text field to file system
   On Error Goto errorhandler

   Dim rtitem As NotesRichTextItem
   Dim body As Variant
   Dim tmpdir As String
   Dim filepath As String


   'get the body field
   Set body = doc.GetFirstItem(fieldname)
   Call body.update

   'get temp dir
   tmpdir = Environ("temp")
   If tmpdir = "" Then tmpdir = Environ("tmp")
   If tmpdir = "" Then tmpdir = "c:\temp"
   Dim sep As String
   sep = "\"
   If Instr(tmpdir, "/") > 0 Then sep = "/"
   Dim fileId As Variant

   'get attachment (should be only one!!)
   Forall att In body.EmbeddedObjects
      If att.Type = EMBED_ATTACHMENT Then
         filepath = tmpDir &  sep  & att.Source
         'Print "filepath: " & filepath
         Call att.ExtractFile(filepath)
         file_detachXFDLTemplate = filepath
         Exit Function
      End If
   End Forall

ex:
   Exit Function
errorhandler:
   Messagebox "Error: " & Err() & " in " & Lsi_info(2) & " line " & Erl()
   Messagebox Error$
   Resume ex
End Function
```

This procedure stores the content of the attachment as plain in-line text to the field *BodyInline* as a mime type. Mime types can be accessed as streams without first storing the content as a file on the file system, when a new form is created. The Notes client/Domino server can read only mime types and files as streams, not simple attachments. To prevent storing files on the file system on each new form on the server, it is done after deploying a new form on the

Notes client on document save. After each attachment update, the procedure rewrites the content in the *BodyInline* field.

To prevent caching in the browser, insert the following code in the form's HTML header content (Example 9-12).

Example 9-12 HTML header code preventing IE6 from caching old content

```
"<META HTTP-EQUIV=\"Pragma\" CONTENT=\"no-cache\">"+
"<META HTTP-EQUIV=\"Expires\" CONTENT=\"-1\">"
```

To configure prepopulation, we must define a framework that fits our needs. In this book, we assume that prepopulation is based, in most cases, on data stored in other Domino documents and that this data corresponds to data instances in the XFDL form. For this purpose, the framework we create does the job. If the scenario changes, the framework should be adjusted.

To address a Notes document, we need to define the database and the unique ID of this document. Other combinations are valid as well (such as DB ReplicaID/DocumentReplicaID or Database path/ View Name/sort key), but we stick with using DB path and DocumentUniversalID in our scenario.

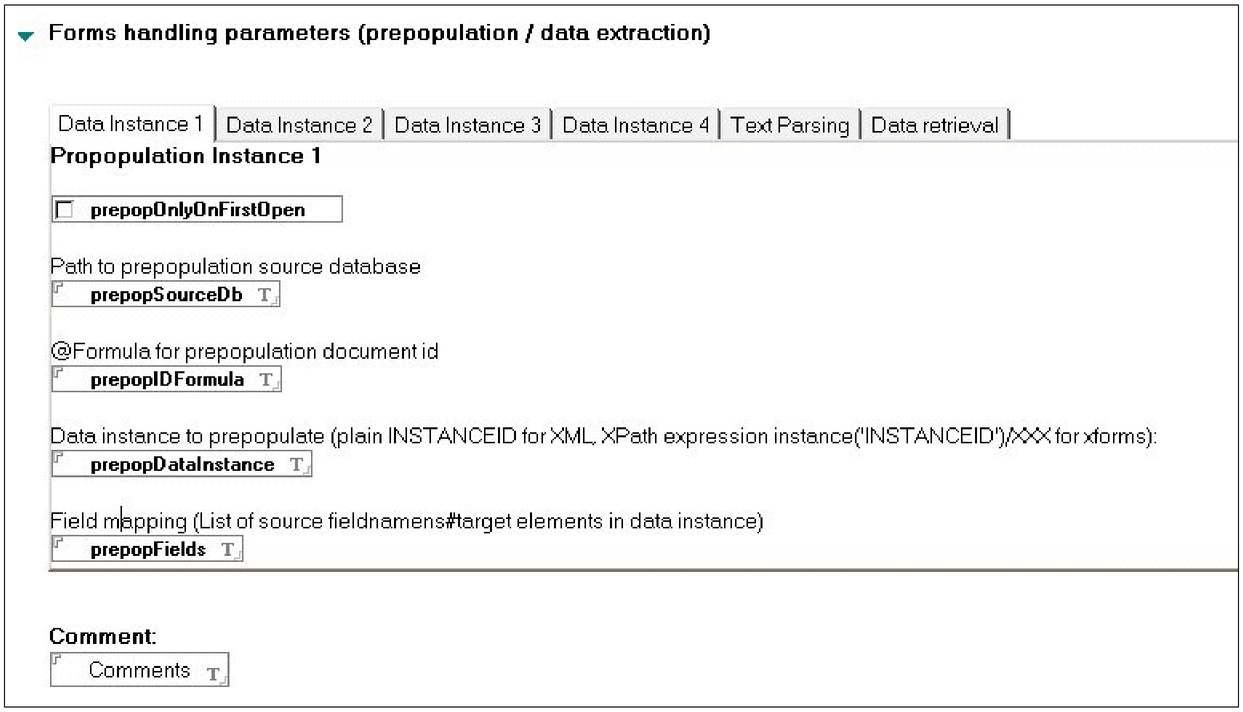
Knowing the source document, we must define what data (fields) to use for prepopulation of additional information — the data instance name in the XFDL form to prepopulate, the field names to read from the document, and the corresponding element names for these fields in the data instance contained in XFDL form. This information is entered in the same document as the related XFDL template. We configure four fields to store this information (Table 9-3).

Table 9-3 Field description for preprocessing information

Field name	**Description**
prepopSourceDb	The path to the database storing the requested information. In our scenario this is the path to the repository database (containing employee data).
prepopIDFormula	The most tricky functionality. Apply here a valid @Formula to compute the UNIQUE ID of the document in the target database, where we read data for prepopulation.
prepopDataInstance	Instance name to prepopulate. In our scenario, this is FormOrgData containing employee data.
prepopFields	List of field names and corresponding element names in the data instance. Multiple lines are possible. A valid entry would be: `ORG_FIRSTNAME#FirstName` Match exactly the (case sensitive) order and naming in XFDL data instance.
prepopOnlyOnFirstOpen	Checkbox field. If selected (value = '1'), this prepopulation should take place only when a form is created from the template (for example, inserting a new ID or creator data). On subsequent form opening, these values should not update anymore. All other settings (with an empty field prepopOnlyOnFirstOpen) should be executed on every form open (for example, supplying the current submission URL or the name and role of the current user).

In reality, we can, to prepopulate more than one data instance, create four identical prepopulation sections (for example, in a tabbed table, as shown in Figure 9-14 on page 520).

Figure 9-14 shows two additional tabs. We create these tabs later on.



Forms handling parameters (prepopulation / data extraction)

Data Instance 1 | Data Instance 2 | Data Instance 3 | Data Instance 4 | Text Parsing | Data retrieval

Propopulation Instance 1

☐ prepopOnlyOnFirstOpen

Path to prepopulation source database
prepopSourceDb T

@Formula for prepopulation document id
prepopIDFormula T

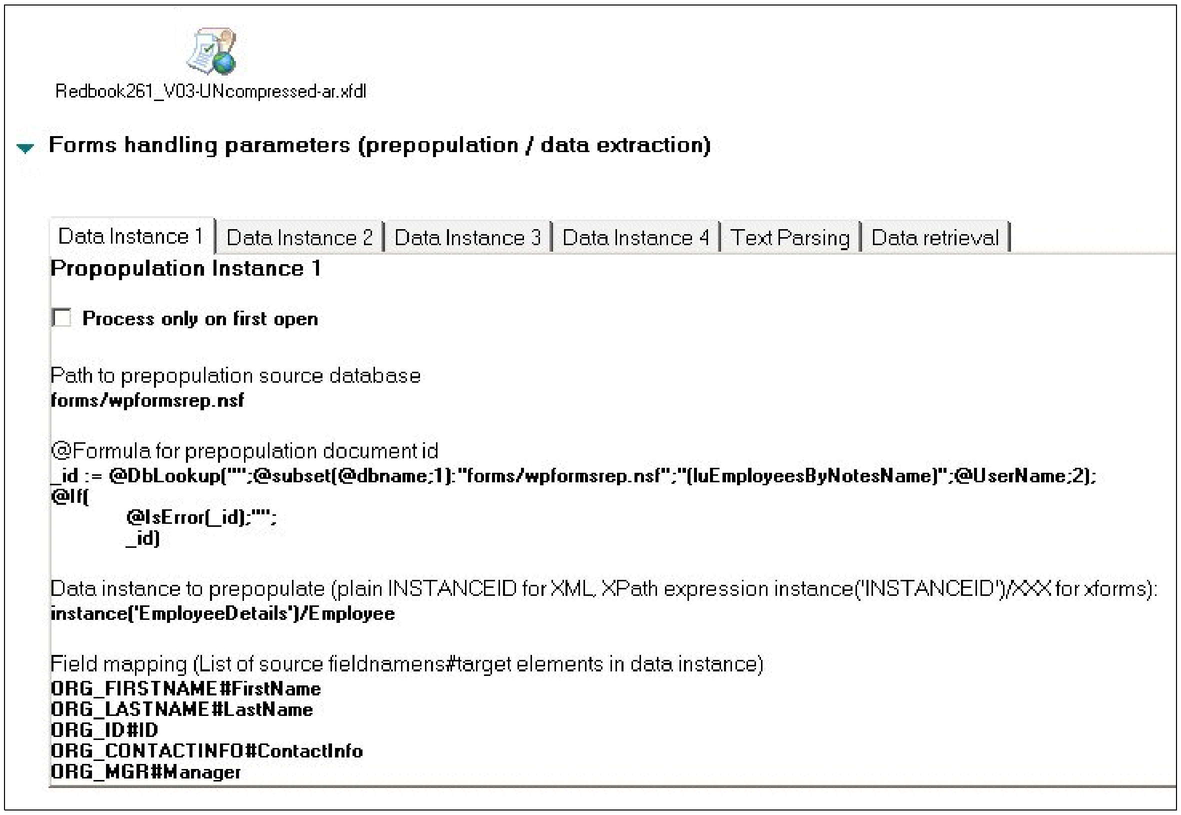
Data instance to prepopulate (plain INSTANCEID for XML, XPath expression instance('INSTANCEID')/XXX for xforms):
prepopDataInstance T

Field mapping (List of source fieldnamens#target elements in data instance)
prepopFields T

Comment:
Comments T

Figure 9-14 Fields defining a document for data prepopulation

The field names on tabs 2, 3, and 4 are the same as in tab 1, but contain the suffixes _1, _2, and _3. In runtime, a template document ready to process data instance prepopulation could look like Figure 9-15.


Redbook261_V03-UNcompressed-ar.xfdl
Forms handling parameters (prepopulation / data extraction)
Data Instance 1
Data Instance 2
Data Instance 3
Data Instance 4
Text Parsing
Data retrieval

Propopulation Instance 1

☐ Process only on first open

Path to prepopulation source database
forms/wpformsrep.nsf

@Formula for prepopulation document id

```
_id := @DbLookup("":@subset(@dbname;1):"forms/wpformsrep.nsf";"(luEmployeesByNotesName)";@UserName;2);
@If(
        @IsError(_id);"";
        _id)
```

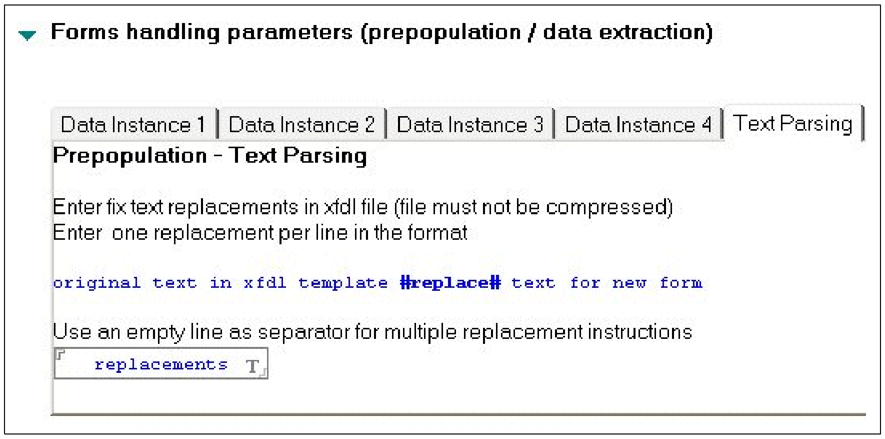
Data instance to prepopulate (plain INSTANCEID for XML, XPath expression instance('INSTANCEID')/XXX for xforms):
instance('EmployeeDetails')/Employee

Field mapping (List of source fieldnamens#target elements in data instance)

```
ORG_FIRSTNAME#FirstName
ORG_LASTNAME#LastName
ORG_ID#ID
ORG_CONTACTINFO#ContactInfo
ORG_MGR#Manager
```

Figure 9-15 Configured Template document with data prepopulation settings

Often the environment requires additional changes to the provided template, for example, adjusting some static entries in the form (such as URLs contained in the template or even the title or some other information) in the initiation process. To do so, we introduce an additional technique for prepopulation — text parsing. To store search and replace values, we create an additional tab named TextParsing containing one multi-value field (replacements), as shown in Figure 9-16.



Prepopulation - Text Parsing

Enter fix text replacements in xfdl file (file must not be compressed)
Enter one replacement per line in the format

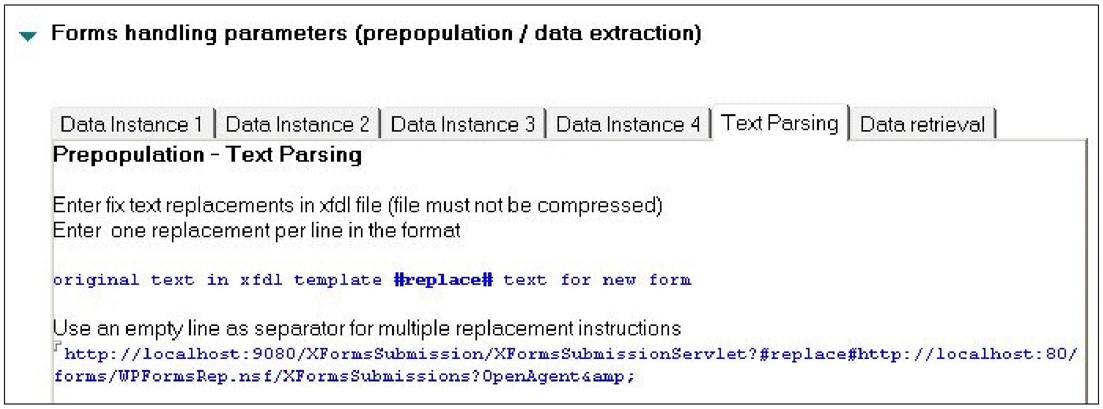
```
original text in xfdl template #replace# text for new form
```

Use an empty line as separator for multiple replacement instructions

```
replacements T
```

Figure 9-16 Replacements tab for text parsing

The information stored in this field controls a search/replace module that runs on the form created from the template before it is submitted to the browser. Make sure to apply suitable separators for the field (use an empty line only). We use this field to exchange URLs that originally point to the WebSphere Application Server (WAS)/J2EE environment and make them point to the corresponding Domino end point (Web service end points, submission URL), but we can exchange that with any text fragment contained in the template. A filled-in TextParsing tab is shown in Figure 9-17.



Prepopulation - Text Parsing

Enter fix text replacements in xfdl file (file must not be compressed)
Enter one replacement per line in the format

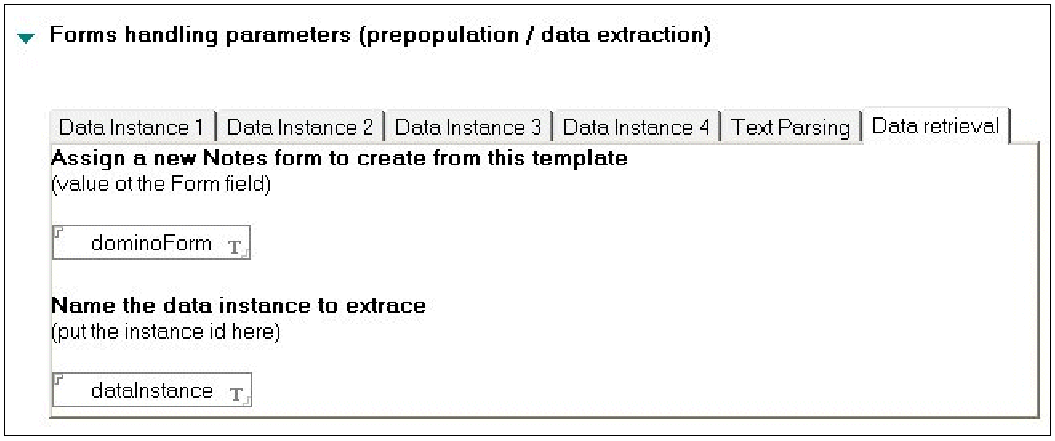
```
original text in xfdl template #replace# text for new form
```

Use an empty line as separator for multiple replacement instructions

```
http://localhost:9080/XFormsSubmission/XFormsSubmissionServlet?#replace#http://localhost:80/
forms/WPFormsRep.nsf/XFormsSubmissions?OpenAgent&amp;
```

Figure 9-17 Replacing target URLs and form title label

On the last tab, we create the configuration for data extraction. It contains the ID of the data instance to extract from the form and the Domino form name to create for incoming new forms, as shown in Figure 9-18.



Assign a new Notes form to create from this template
(value ot the Form field)

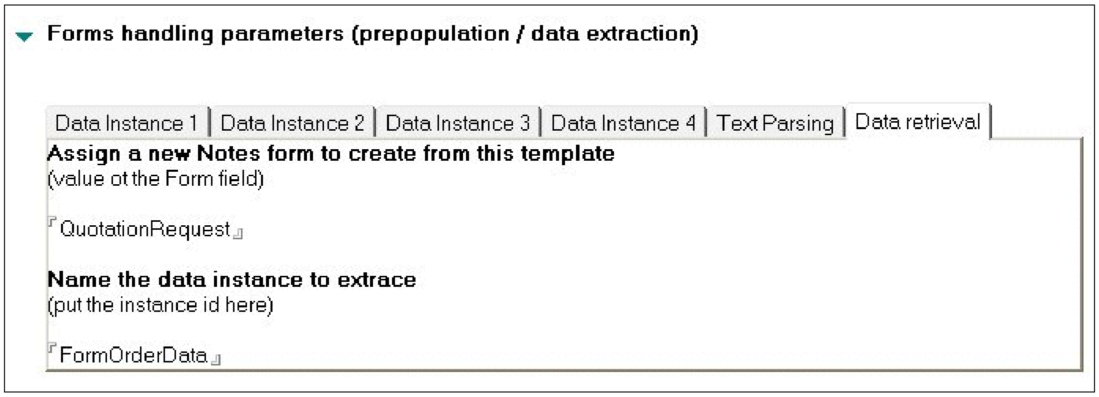
dominoForm

Name the data instance to extrace
(put the instance id here)

dataInstance

Figure 9-18 Data retrieval tab

Figure 9-19 is an example for a configured data retrieval operation.


Forms handling parameters (prepopulation / data extraction)

Assign a new Notes form to create from this template
(value ot the Form field)

QuotationRequest

Name the data instance to extrace
(put the instance id here)

FormOrderData

Figure 9-19 Configured data retrieval

All the prerequisites to write the code that creates a new form from the template are now created:

- Template storage installed with a template ready to read as a stream
- Configuration fields for data instance prepopulation setup
- Configuration for additional test parsing setup
- Data retrieval configured

Let us now define how a new form is created from a template.

Creating a new form from template, embedding template in HTML form

As in the J2EE scenario, we need a procedure that reads the template and prepares the data for prepopulation. This can be easily done in Domino by calling an agent (either LotusScript or Java) from a URL triggered from the browser client. We take another approach here by triggering a URL that opens a new form in the template database.

This form opens upon running an agent that collects the necessary information and then sends an HTML page to the browser containing the new form ready for viewing via the Viewer plug-in. We refer to the agent as the *initiation agent*. Alternatively, we can create a Java agent, and reuse the main code from the J2EE environment, but let us first show how to make things work using LotusScript.

LotusScript can easily access external libraries if they are registered as OLE automation classes. Workplace Forms offers a COM API. Unfortunately, the registration does not show up as automation classes, making it hard to access these classes. Assuming that a non Windows-based operating system is used in the server environment, the COM interface is not available at all, so we should look for other techniques to do the prepopulation.

Workplace Forms provides a way to embed an XFDL file into an HTTP page. This is done by registering a Workplace Forms object to the HTML form and including a full XFDL file as a <SCRIPT> element activated by the object. The HTML page can contain additional initiation scripts, which contain prepopulation instructions and data. When the browser opens the HTTP page, the object is initiated (the Viewer pops up). The Viewer renders the contained form and executes all registered scripts from the HTML page before the user can access the page.

The generated HTML page is shown in Example 9-13.

Example 9-13 Sample for an embedded XFDL document

```
<BODY>
<HTML><BODY>
<OBJECT id="Object2" height="2000" width="980" border="1"
classid="CLSID:354913B2-7190-49C0-944B-1507C9125367">
<PARAM NAME="XFDLID" VALUE="XFDLData">
<PARAM NAME="instance_1" VALUE="ElementName InstanceId replace [0]">
</OBJECT>
<SCRIPT id=ElementName type="application/vnd.xfdl; wrapped=comment">
<!--
   <DataInstanceX>
      <FIELD1>val1</FIELD1>
      <FIELD2>val2</FIELD2>
   </DataInstanceX>
-->
</SCRIPT>
<SCRIPT language="XFDL" id="XFDLData" type="application/vnd.xfdl; wrapped=comment">
<!--
<?xml version="1.0" encoding="ISO-8859-1"?>
<XFDL xmlns="http://www.PureEdge.com/XFDL/6.5"
....
the full xfdl document is located here
....
</XFDL>
-->
</SCRIPT>
<BODY>
```

The page contains the elements listed in Table 9-4.

Table 9-4 Element description for an embedded XFDL page

<OBJECT>	**Description**
<OBJECT >	Object element that registers the Viewer class and sets up Viewer behavior with the contained attributes and child elements. ID - arbitrary but unique name in the page. width, height - space allocated in browser by the open Viewer. classid - ID of Viewer activeX control in Windows registry.

`classid="CLSID:354913B2-7190-49C0-944B-1507C9125367"` `parameter in OBJECT element`	This class ID is reserved for the Forms Viewer (version independent) in the Windows registry. Using other browsers (as Mozilla, or Firefox, apply the attribute type="application/vnd.xfdl" in this place.
	Working with multiple browser types, apply the following nested object structure:
	<OBJECT id="ObjectForIE" ...
	classid="CLSID:354913B2-7190-49C0-944B-1507C9125367">
	  <PARAM NAME="XFDLID" VALUE="XFDLData">
	  ......
	  <!--[if !IE]>-->
	    <OBJECT ID="ObjectForFF" ..... type="application/vnd.xfdl">
	      <PARAM NAME="XFDLID" VALUE="XFDLData">
	    ....
	    </OBJECT>
	  <!--<![endif]-->
	</OBJECT>

<OBJECT>	Description
`<PARAM NAME="XFDLID" VALUE="XFDLData">`	Defines the ID of the script element that contains the XFDL form. The value can be anything, as long as the XFDLID and the script ID match.

For an XML instance:
`<PARAM NAME="instance_1" VALUE="ElementName InstanceId replace [0]">`
 	
or
 	
For an XForms instance:
`<PARAM NAME="instance_1" VALUE="ElementName xforms; replace=instance('instance_2')/level0/level1">`
	Identifies XML instances or XForms instances inside an HTML page. These instances can be used to modify specified XML instances inside the XFDL form. This information includes:
	► The ID of the new instance to create
	► The ID of the form instance to locate
	Two additional values may be included:
	► Either replace or append, depending upon whether the new instance data replaces or adds to the original instance data. Note that replace is the default value.
	► The reference within the instance that indicates where the new data should be placed. Note that any namespaces listed in this value resolve relative to the document root.
	Multiple instance parameters must have sequentially numbered names, starting with 1. For example, instance_1, instance_2, and so on.
	Be aware that processing will stop at the first missing instance (for example, applying instance_1, instance_2, and instance_4. Only the 2 first instances are recognized by the viewer.).
	Pay attention to the different structure of the value attribute for XML instances and XForms instances:
	XML: `VALUE="ElementName InstanceId replace [0]"`
	XForms: `VALUE="ElementName xforms; replace=instance('instance_2')/level0/level1"`

`<SCRIPT id=ElementName type="application/vnd.xfdl; wrapped=comment">`
`<!--`
`   <DataInstanceX>`
`      <FIELD1>val1</FIELD1>`
`      <FIELD2>val2</FIELD2>`
`   </DataInstanceX>`
`-->`
	Script containing the data for prepopulation. The data must contain a valid XML instance with the data to insert in the XFDL file. The ID must match the first part of the corresponding parameter with the name Instance_x.

<OBJECT>	Description

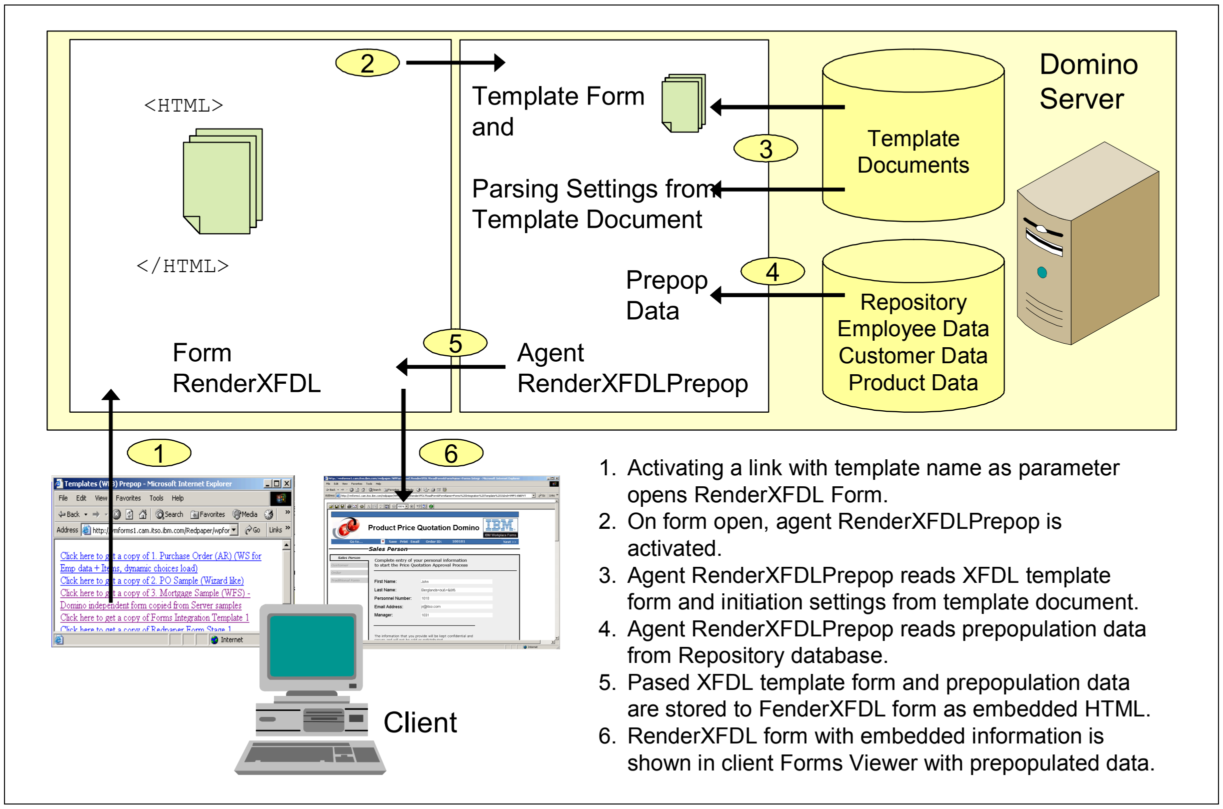
`<?xml version="1.0" encoding="ISO-8859-1"?>`
`<XFDL`
`....`
`</XFDL>`
	Includes the full XFDL file.
	Note that Mozilla-based browsers require XML fragments smaller than 64 KByte to render the XML properly. Therefore, big forms should be submitted as multiple fragments (named chunks). The required structure of a chunked xml object is stream is:
	`<?xml version="1.0" encoding="ISO-8859-1"?>`
	`.....`
	`<SCRIPT ... id=”xxxx” next-chunk=chunk_1>`
	`....`
	`</SCRIPT>`
	`<SCRIPT ... id=”chunk_1” next-chunk=chunk_2>`
	`....`
	`</SCRIPT>`
	`<SCRIPT ... id=”chunk_3” next-chunk=chunk_2>`
	`....`
	`</SCRIPT>`
	....
	`<SCRIPT ... id=”chunk_N”>`
	`....`
	`</SCRIPT>`
	The last object in the chain does not contain the *next-chunk* attribute.

For a deep dive into forms embedding in an HTML page, see *Embedding the Viewer in HTML Web Pages* at:

http://www.elink.ibmlink.ibm.com/publications/servlet/pbi.wss?CTY=CA&FNC=SRX&PBL=S325-2598

Attention: In this book we do not implement advanced embedding features such as Viewer parking, which is discussed in the product documentation. If you plan to use this feature, make sure to apply, for each opened single form in the Viewer, a different value for the detach_id. Do not copy the sample HTML embedding in a static way to your application. Otherwise you would experience unexpected caching effects.

To make the page generic for use with multiple forms, we set up a Domino form containing an HTML skeleton for this data structure. All relevant (or almost all relevant) places containing variable names are dynamically filled in using Domino fields or computed text. The initiation agent inserts the necessary content in the document fields and submits the complete new document as an HTML page to the browser (Figure 9-20).



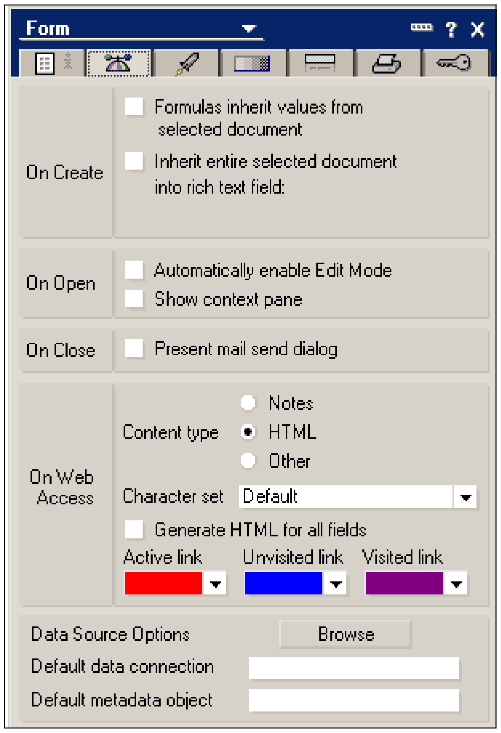
1. Activating a link with template name as parameter opens RenderXFDL Form.
2. On form open, agent RenderXFDLPrepop is activated.
3. Agent RenderXFDLPrepop reads XFDL template form and initiation settings from template document.
4. Agent RenderXFDLPrepop reads prepopulation data from Repository database.
5. Pased XFDL template form and prepopulation data are stored to FenderXFDL form as embedded HTML.
6. RenderXFDL form with embedded information is shown in client Forms Viewer with prepopulated data.

Figure 9-20 High-level flow in the Domino new document scenario

Initiation form RenderXFDL

We now create the new document form for HTML rendering:

1. Create a form named `RenderXFDL` and set the content type to **HTML** (Figure 9-21).



On Create
- [ ] Formulas inherit values from selected document
- [ ] Inherit entire selected document into rich text field:

On Open
- [ ] Automatically enable Edit Mode
- [ ] Show context pane

On Close
- [ ] Present mail send dialog

On Web Access
Content type: Notes [✓ HTML] Other
Character set: Default
- [ ] Generate HTML for all fields

Active link 🟥 Unvisited link 🟦 Visited link 🟪

Data Source Options Browse
Default data connection
Default metadata object

Figure 9-21 Form properties - Content Type = HTML

2. Create the following elements on the form (Table 9-5).

Table 9-5 RenderXFDL form components

Component	**Description**
Field Query_String_Decoded	Editable, hidden from browser. Contains the decoded query string. This CGI variable contains all parameters from the calling URL (in this case the template to open, like ReadForm&FormName=Redpaper Form&Ind=ARWE-6N2ULV).

Static text as Pass-Thru HTML	`<BODY>`
	`<HTML><BODY>`

First part of XFDL object tag	`<OBJECT id="Object2" height="2000" width="980" border="1" classid="CLSID:354913B2-7190-49C0-944B-1507C9125367">`
	`<PARAM NAME="XFDLID" VALUE="XFDLData">`
	
	The parameters for height, width, and border could be variable too. We use static values here.

Component	Description
The script registration for the first data instance to prepopulate	<!-- red lines are hidden, when no prepopulation data available (PrepopulationDocUNID_x="") --> <PARAM NAME="instance_1" VALUE="<Computed Value>"> These lines must be hidden when we do not have a prepopulation. (Apply hide when Formula: `PrepopulationDocUNID=""`) The computed values return the content of field prepopEmbeddingParams. The initiation agent creates this field and fills it with the instance ID of the data instance to prepopulate. We have here identical names for the new instance name and the instance name in the HTML document containing new data.
Registration for the other four potential prepopulations (We need one additional instance for generic environment data stored in the instance with the id ConfigurationInfo.)	<PARAM NAME="instance_2" VALUE="<Computed Value>"> <PARAM NAME="instance_3" VALUE="<Computed Value>"> <PARAM NAME="instance_4" VALUE="<Computed Value>"> <PARAM NAME="instance_5" VALUE="<Computed Value>"> Hide each line when the corresponding prepopulationUNID is empty. (Apply hide when Formula: `PrepopulationDocUNID_x=""` where x = 1, 2, 3, or 4.) The computed values return the content of field prepopEmbeddingParams_x. The initiation agent creates this field and fills it with the instance ID of the second, third, or forth data instance to prepopulate.
Closing tag for the object	`</OBJECT>`

SCRIPT tag containing the instance data for first data instance to prepopulate	`<SCRIPT id=<Computed Value> type="application/vnd.xfdl; wrapped=comment">`
	`<!-- [RTF Field Prepop]--></SCRIPT>`
	
	HTML script tag surrounding the field Prepop that contains the instance data for first prepopulation instance. The computed values return the content of field prepopDataInstance.
	Hide these two lines when we do not have a prepopulation. (Apply hide when formula: `PrepopulationDocUNID=""`)

SCRIPT tags containing the instance data for the other 4 data instances to prepopulate	`<SCRIPT id=<Computed Value> type="application/vnd.xfdl; wrapped=comment"><!--[RTF Field Prepop]--></SCRIPT>`
	`<SCRIPT id=<Computed Value> type="application/vnd.xfdl; wrapped=comment"><!-- [RTF Field Prepop_1]--></SCRIPT>`
	`<SCRIPT id=<Computed Value> type="application/vnd.xfdl; wrapped=comment"><!-- [RTF Field Prepop_2]--></SCRIPT>`
	`<SCRIPT id=<Computed Value> type="application/vnd.xfdl; wrapped=comment"><!-- [RTF Field Prepop_3]--></SCRIPT>`
	`<SCRIPT id=<Computed Value> type="application/vnd.xfdl; wrapped=comment"><!-- [RTF Field Prepop_4]--></SCRIPT>`
	`<SCRIPT id=<Computed Value> type="application/vnd.xfdl; wrapped=comment">`
	
	HTML script tags surrounding the fields Prepop_x that contains the instance data for three other prepopulation instances. The computed values return the content of the corresponding field prepopDataInstance_x.
	Hide lines when we do not have a prepopulation. (Apply hide when formula: `PrepopulationDocUNID_x=""` for each line with x 1, 2, 3, or 4.)

Component	Description

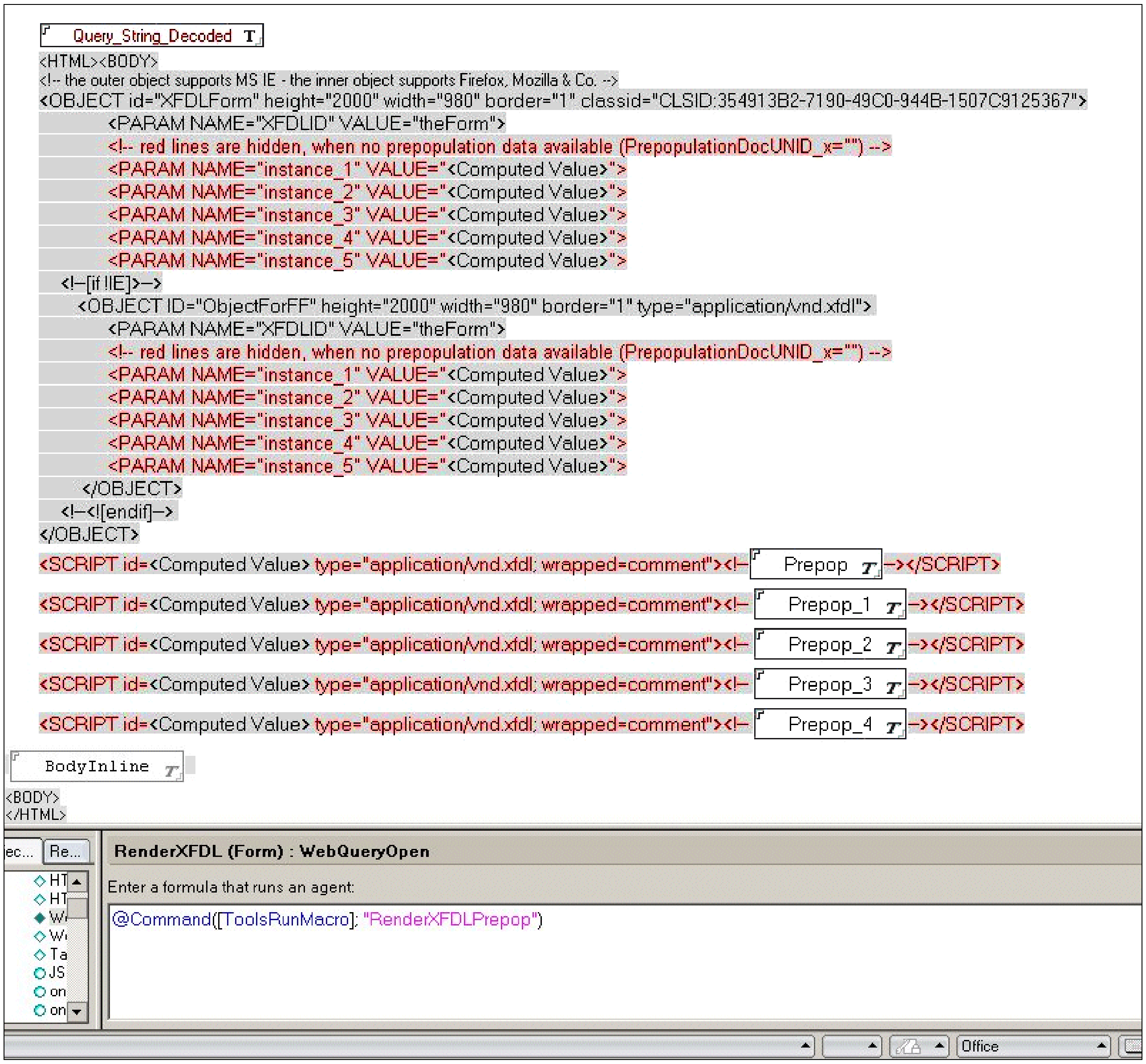
Embedded XFDL form	`<SCRIPT language="XFDL" id="XFDLData"`
	`type="application/vnd.xfdl; wrapped=comment">`
	`<!--  [RTF Field BodyInline] -->`
	`</SCRIPT>`
	
	HTML script tag surrounding BodyInline field that contains the embedded XFDL form as plain text.

End tag for Body	`</BODY>`

3. All content on this page, except for the hidden first line containing the field Query_String_Decoded, must be set to Pass-Thru HTML.
4. To support Mozilla and Firefox, we create the embedded objects, as discussed before, as nested objects.
5. Assign a WebQueryOpen agent to the form. Open the WebQueryOpen event and assign the following @Formula:

```
@Command([ToolsRunMacro]; "RenderXFDLPrepop")
```

6. Save the form. The completed form is shown in Figure 9-22.



```
Query_String_Decoded
<HTML><BODY>
<!-- the outer object supports MS IE - the inner object supports Firefox, Mozilla & Co. -->
<OBJECT id="XFDLForm" height="2000" width="980" border="1" classid="CLSID:354913B2-7190-49C0-944B-1507C9125367">
        <PARAM NAME="XFDLID" VALUE="theForm">
        <!-- red lines are hidden, when no prepopulation data available (PrepopulationDocUNID_x="") -->
        <PARAM NAME="instance_1" VALUE="<Computed Value>">
        <PARAM NAME="instance_2" VALUE="<Computed Value>">
        <PARAM NAME="instance_3" VALUE="<Computed Value>">
        <PARAM NAME="instance_4" VALUE="<Computed Value>">
        <PARAM NAME="instance_5" VALUE="<Computed Value>">
  <!--[if !IE]>-->
    <OBJECT ID="ObjectForFF" height="2000" width="980" border="1" type="application/vnd.xfdl">
        <PARAM NAME="XFDLID" VALUE="theForm">
        <!-- red lines are hidden, when no prepopulation data available (PrepopulationDocUNID_x="") -->
        <PARAM NAME="instance_1" VALUE="<Computed Value>">
        <PARAM NAME="instance_2" VALUE="<Computed Value>">
        <PARAM NAME="instance_3" VALUE="<Computed Value>">
        <PARAM NAME="instance_4" VALUE="<Computed Value>">
        <PARAM NAME="instance_5" VALUE="<Computed Value>">
    </OBJECT>
  <!--<![endif]-->
</OBJECT>
<SCRIPT id=<Computed Value> type="application/vnd.xfdl; wrapped=comment"><!-- Prepop --></SCRIPT>
<SCRIPT id=<Computed Value> type="application/vnd.xfdl; wrapped=comment"><!-- Prepop_1 --></SCRIPT>
<SCRIPT id=<Computed Value> type="application/vnd.xfdl; wrapped=comment"><!-- Prepop_2 --></SCRIPT>
<SCRIPT id=<Computed Value> type="application/vnd.xfdl; wrapped=comment"><!-- Prepop_3 --></SCRIPT>
<SCRIPT id=<Computed Value> type="application/vnd.xfdl; wrapped=comment"><!-- Prepop_4 --></SCRIPT>
BodyInline
<BODY>
</HTML>
```

RenderXFDL (Form) : WebQueryOpen

Enter a formula that runs an agent:

```
@Command([ToolsRunMacro]; "RenderXFDLPrepop")
```

Figure 9-22 Form RenderXFDLPrepop preparing a embedded XFDL form with prepopulation

Tip: The decisions are arbitrary as to what content to render in the form as static text, what content to render as computed text, and what content is available as content of rich text fields. We can, for example, create the whole content as one large character stream containing the embedding information, the prepopulation data, and the XFDL file, and store it to one single rich text field as well. The structure given in this chapter should make the internal structure visible.

Note: Signing a form embedded in an HTML page can cause broken signatures when validating the signature without the embedding page being available at the signing moment. In these cases, you should take care of the options and item types signed by default. To correct this, open the **Advanced Group Options** tab at the detail page of a signing button in the Forms Designer and adjust the group signing options and item types.

Now create the agent that fills in the newly created form with data.

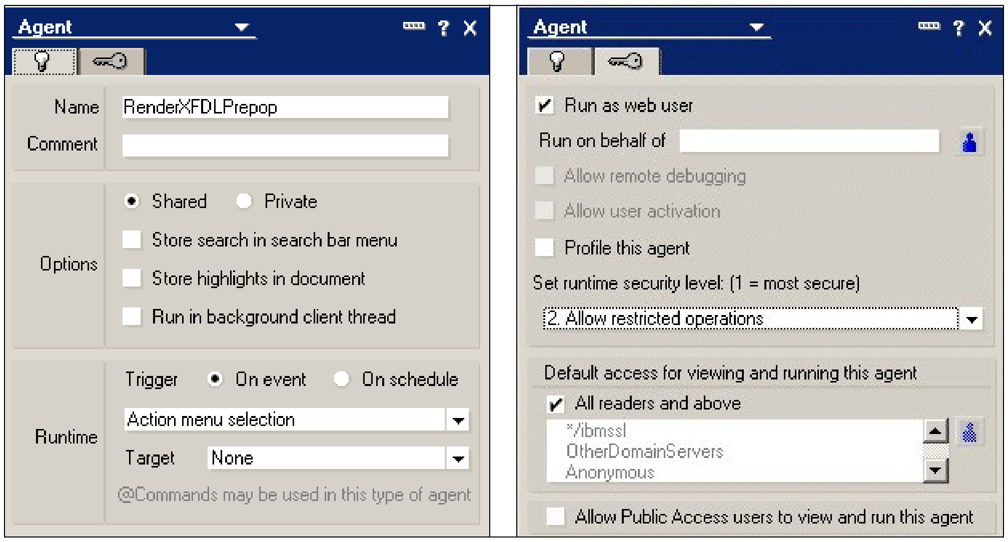
Initiation agent RenderXFDLPrepop

The initiation agent runs when the form is opened and executes the following actions:

- Locates the corresponding template document in the database
- Reads the configuration settings from the document (prepopulation settings, search/replace statements)
- Computes all necessary fields in this document (set data instance names, create XML structures for instance data)
- Reads the XFDL form template from the template document
- Executes the text parsing operation (search/replace)
- Inserts the reworked (stored as inline mime type) XFDL template in the corresponding field of the new document form

The following steps demonstrate how the new initiation agent is created:

1. Create a new agent in the database and name it RenderXFDLPrepop. Make it a LotusScript agent with a runtime target None.
2. Select **Run as web user**, with restricted operations (this agent performs a lookup of information in other databases). Running as a Web user enables us to read the user name from the session object (Figure 9-23).



Name: RenderXFDLPrepop
Comment:
Options: [✓ Shared] Private
Store search in search bar menu
Store highlights in document
Run in background client thread
Runtime: Trigger [✓ On event] On schedule
Action menu selection
Target: None
@Commands may be used in this type of agent

[✓ Run as web user]
Run on behalf of
Allow remote debugging
Allow user activation
Profile this agent
Set runtime security level: (1 = most secure)
2. Allow restricted operations
Default access for viewing and running this agent
[✓ All readers and above]
*/ibmssl
OtherDomainServers
Anonymous
Allow Public Access users to view and run this agent

Figure 9-23 Initiation agent settings

3. Apply the following statements in (Options) and (Declarations) and supporting functions (Example 9-14).

Example 9-14 Options init event for initiation agent

```
'RenderXFDLPrepop:

Option Public
Option Declare
Use "LibFormsIntegration"



Const CONSTLIBNAME = "Agent RenderXFDLPrepop"

Sub Initialize
   On Error Goto errorhandler
   Call  web_createEmbeddedXFDLPage()

   Exit Sub
errorhandler:
   Messagebox "Error: " & Err() & " in " & CONSTLIBNAME & "." & Lsi_info(2) & "
line " & Erl()
   Messagebox Error$
   Exit Sub
End Sub
```

4. Create the main routine and several helper methods in the assigned script library. The main routine code, as shown in Example 9-15, goes through the following steps:
   a. Read the URL parameters to detect, from which template to create a new form.
   b. Read the form stored as mime type in the template document and execute text parsing on it (procedure web_initialTextParsing).
   c. Update the XFDL stream with the environment settings (username, submission URL, form to create, and more; procedure forms_prepopLSConfigInfo). This works only on uncompressed forms.
   d. Create a new document (not stored) based on the form RenderXFDL that we just created, and copy the parsed form into this document (procedure web_writeEmbeddedXFDL).
   e. Create the XML fragments for the additional data instances (1...4) defined in the template document and the internal data instance for prepopulation (procedure forms_createPrepopInstances) and store them to the created Domino document.

Example 9-15 Main routine called from agent RenderXFDL Prepop

```
Sub web_createEmbeddedXFDLPage()
   On Error Goto errorhandler
   Dim session As New NotesSession
   Dim db As NotesDatabase
   Dim doc As NotesDocument
   Dim template As NotesDocument
   Dim View As NotesView
   Set doc = session.DocumentContext
   Dim rtitem As Variant
   Dim Body As NotesRichTextItem
   Dim username As String
   Dim formName As String
   Dim xfdl As String

   Dim params As Variant
   Dim CommandStr  As String

   Set db = session.CurrentDatabase

   CommandStr = session.DocumentContext.Query_String_Decoded(0)
   'ReadForm&FormName=Redpaper Form&Ind=ARWE-6N2ULV

   userName = session.EffectiveUserName

   'Messagebox "params: " & CommandStr
   params = Split(CommandStr , "&")
   Forall p In params
      Messagebox "param: " & p
      If Instr(p, "FormName=") = 1 Then formName = Strright(p, "=")
   End Forall

   'Find the template document that contains the XFDL attachment based on the title in
eForm field
   Messagebox "get Template: " + formName
   Set View = db.GetView("Templates (Notes)")
   Set template=View.GetDocumentByKey(formName)
   If template Is Nothing Then
      Messagebox  "got NO Template: " + formName
   Else
      Messagebox  "got Template: " + formName
   End If

   'copy xfdl content to new doc
   Set body = template.GetFirstItem("BodyInline")

   xfdl = body.GetUnformattedText
   'text parsing if used
   Call forms_initialTextParsing(xfdl, template)
   'set submission url and user name to the form
   'this will make sure, in uncompressed forms any call for data will work just on
   'forms load.In compressed forms, this function will fail and the config data
   'is availabel in the form only
   'after reading the embedded instance data (= after form load).
   Call  forms_prepopLSConfigInfo(xfdl , template)Call  forms_prepopLSConfigInfo(xfdl ,
      template)
   'embed the xfdl as chunks
   Call web_writeEmbeddedXFDL(xfdl, doc)
   'create prepopulation scripts in embedded page including additional fieldss for .
      'html embedding (form Embedding param  = true)
   'create instance data and embedding parameters (param formEmbedding = true)
   Call forms_createPrepopInstances(doc, template, true)

   Exit Sub
errorhandler:
   Messagebox "Error: " & Err() & " in " & Lsi_info(2) & " line " & Erl()
   Messagebox Error$
   Exit Sub
End Sub
```

After the agent completes, the newly created document is sent to the browser client and shows up as an embedded viewer object in the browser.

We do not discuss the other helper routines used by the code in detail. For details download the Notes databases from the Redbooks resources page in Appendix D, “Additional material” on page 693, and inspect the code.

Table 9-6 contains a brief overview that shows the modules engaged for this use case.

Table 9-6 Functions used to compose the HTML page with embedded XFDL

Function/sub	Comments
web_writeEmbeddedXFDL(xfdl As String, doc As NotesDocument)	Copies an XML string (XFDL) in a rich text field (BodyInline). Utilizes splitting the string in chunks.
forms_initialTextParsing(xfdl As String, template As NotesDocument)	Processes a search/replace in XFDL string based on the parameters found in the template document, field replacements.
forms_createPrepopInstances(doc As NotesDocument, template As NotesDocument, formEmbedding As Integer)	Creates the prepopulation fields in the virtual document used for HTML embedding. Parses the information stored in the prepopulation table in the template document and composes the related fields in the virtual document used for browser embedding. In addition, it creates prepopulation data for the ConfigurationInfo. instance. (This must not be covered in the template document.)
forms_prepopLSConfigInfo(xfdl As String, doc As NotesDocument)	Dependent on the form type (XForms/XFDL) the function creates an XML structure to update the ConfigurationInfo instance (XForms Model) in the XFDL string OR. Writes entries into the XFDL global.global sections (XFDL documents) for the required environment information. In compressed forms, the function cannot work.
forms_prepopLS_updateDataInstance(form As String, instancePath As String, InstanceData As String)	Replace an instance — XFDL instance or XForms instance — with the content found in instanceData parameter.
forms_prepop_createInstanceData(template As NotesDocument, doc As NotesDocument, instanceCounter As Integer, instanceID As String) As String	Creates the XML data for one of the data instances to prepopulate in the template document. Reads source information (db, @formula to execute), executes the data query, and composes an XML fragment ready to replace the content of the given instance.
forms_prepopLS_createConfigInfoInstance(doc As NotesDocument, XFDLID As String) As String	Does prepop only, if we really have values (otherwise leave the existing values in the form). For HTTP PostSubmission sample - set submission URL and next URL parameter.
xml_getXMLElement (elementName As String, form As String) As String	Reads one assigned xml element from an xml structure.
xml_setXMLElement(elementName As String, form As String, content As String)	Updates one XML element in a XML structure with the given content. If the element name matches some defined names in the global.global section, it creates these elements if they do not exist.

Function/sub	Comments
xml_createElement(elementName As String, elementContent As String, attributes As String) as string	Creates one XML element based on element name and content composing the corresponding xml structure as: `<name attributes>content</name>`
utils_replaceSubstring(str1 As String, str2 As String, str3 As String) As String	Search/replace in a string.
utils_getParamT(key As String, db As notesdatabase) As String	Reads on parameter value as text from the parameter documents stored in the database.
utils_encode(Byval strg As String) As String	Simple encoder eliminating special HTML characters.

5. The agent is ready to run.

Note: The created document is never saved. It exists only as an in-memory copy and disappears whenever the session ends. To store a document, we wait for a submission from the browser. The related code is discussed in the next section.

Important: In this scenario we use two different prepopulation techniques: text parsing (quick and dirty) and embedded instances in an HTML page updating the inner part of the XFDL page using the Viewer engine. They differ not only in the used technique, but also in the execution time.

Text parsing occurs before the Viewer opens the document, so all settings are present when the Viewer constructs the node tree. Prepopulation via embedded instance objects takes place after the Viewer has built the node structure. Any events or calculations executed while building the node structure cannot utilize the information available in the prepared prepopulation XML. Make sure that the form design does not rely on that information.

In our case, we update the submission URL to the ConfigurationInfo instance. The information is written to the submit buttons on first node construction. Therefore, the prepopulation via embedded instances occurs too late. That is why we try to update the information additionally using text parsing knowing that this works on uncompressed forms only.

We now have to create two more components to make the new form creation possible:

- A template view for the browser showing available templates with specific URLs
- At least one template document in the database

First, we create the template view.

Template (WEB) Prepop view

Create a new view in Domino Designer available for browsers only with two columns. Use the following values to create the view:

- View name: `Templates (WEB) prepop`
- View alias: `TemplatesPrepop`

- View selection formula: `SELECT Form="FormTemplate"`
- Column 1 value: Field `PEFormName`; plain sort
- Column 2 value: @Formula

```
_db := @ReplaceSubstring(@Trim(@DbName);"\\";"/");

"<A href=\"/" + _db + "/RenderXFDL" +
?ReadForm&FormName="+@URLEncode("Domino";PEFormName) +
"&Ind=" + @Unique + "\">Click here to get a copy of "+PEFormName+"</A>"
```

The second column creates a link like this:

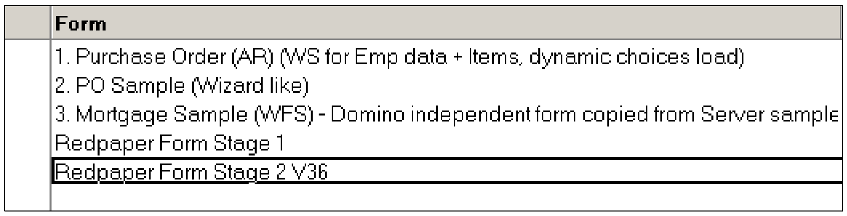
```
http://vmforms261.cam.itso.ibm.com/forms/WPForms.nsf/RenderXFDL?ReadForm&FormName=
MyFormTemplate&Ind=VMFS-6NDPF6
```

The link opens in the template database a new document using the RenderXFDL form. This runs the RenderXFDLPrepop agent to fill the created document with the corresponding values. The parameters specify:

- The template to use is: (*FormName=MyFormTemplate*).
- The *Ind* parameter changes for each view entry, preventing possible caching on the server.

The initiation agent extracts the FormName parameter and creates the appropriate field settings in the RenderXFDL form.

Create another view for this form to show the available templates for the Notes client. Hide this view for Web clients. There are no special settings for this view, as shown in Figure 9-24.



	Form
	1. Purchase Order (AR) (WS for Emp data + Items, dynamic choices load)
	2. PO Sample (Wizard like)
	3. Mortgage Sample (WFS) - Domino independent form copied from Server sample
	Redpaper Form Stage 1
	Redpaper Form Stage 2 V36

Figure 9-24 Template view in Notes client

Creating a template document

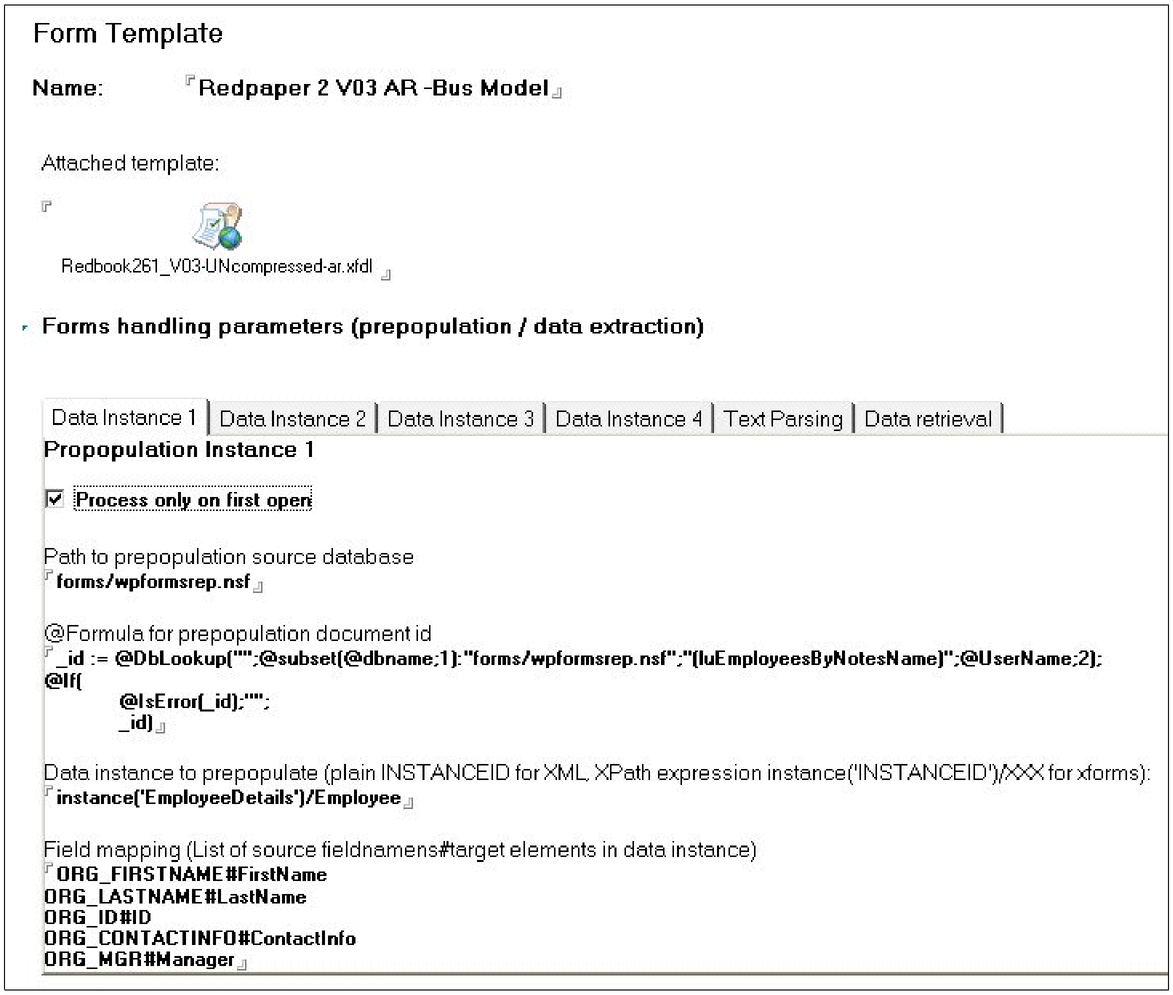
The last step before the first test of scenario 1 is to create at least one template document:

1. Open the template database in the Notes client, and go to the Template view.
2. Create a new template document. Choose from the menu **Create** → **FormTemplate**.
3. Enter a value in the Name field (such as `Forms Integration Template 1`).
4. Attach a form template used in J2EE stage 2 (or choose the appropriate form template from the Redbooks resource zip).

5. Enter prepopulation settings for employee data prepopulation, as shown in Figure 9-25.

   Make sure that the assigned names (instance ID, Notes field names, element names in the data instance) exactly match the names used in the Notes/XFDL template.

   The assigned formula should find the employee data in the repository database.


Form Template

Name: Redpaper 2 V03 AR -Bus Model

Attached template:

Redbook261_V03-UNcompressed-ar.xfdl

Forms handling parameters (prepopulation / data extraction)

Data Instance 1 | Data Instance 2 | Data Instance 3 | Data Instance 4 | Text Parsing | Data retrieval

Propopulation Instance 1

☑ **Process only on first open**

Path to prepopulation source database
forms/wpformsrep.nsf

@Formula for prepopulation document id
```
_id := @DbLookup("":@subset(@dbname;1):"forms/wpformsrep.nsf":"(luEmployeesByNotesName)":@UserName;2);
@If(
        @IsError(_id);"";
        _id)
```

Data instance to prepopulate (plain INSTANCEID for XML, XPath expression instance('INSTANCEID')/XXX for xforms):
instance('EmployeeDetails')/Employee

Field mapping (List of source fieldnamens#target elements in data instance)
```
ORG_FIRSTNAME#FirstName
ORG_LASTNAME#LastName
ORG_ID#ID
ORG_CONTACTINFO#ContactInfo
ORG_MGR#Manager
```

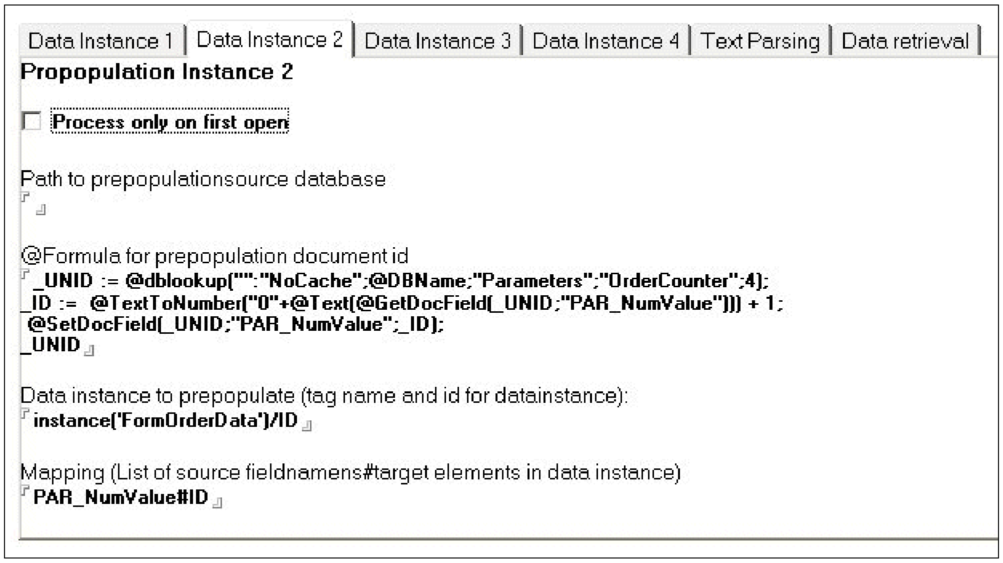
Figure 9-25 Template name, attachment, and prepopulation for employee data

The prepopulation settings on this tab make up an XML fragment for prepopulation, as shown in Example 9-16.

Example 9-16 The prepopulation fragment for data instance FormOrgData

```
<Employee>
   <FirstName>John</FirstName>
   <LastName>Miller</LastName>
   <ID>1010</ID>
   <ContactInfo>jr@itso.com</ContactInfo>
   <Manager>1031</Manager>
</Employee>
```

6. Switch to the Data Instance 2 tab and enter the settings shown in Figure 9-26. They increment the order ID parameter and prepare the new order ID XML fragment as shown in Example 9-17.



Propopulation Instance 2

☐ Process only on first open

Path to prepopulationsource database

@Formula for prepopulation document id

```
_UNID := @dblookup("":"NoCache";@DBName;"Parameters";"OrderCounter";4);
_ID :=  @TextToNumber("0"+@Text(@GetDocField(_UNID;"PAR_NumValue"))) + 1;
 @SetDocField(_UNID;"PAR_NumValue";_ID);
_UNID
```

Data instance to prepopulate (tag name and id for datainstance):

instance('FormOrderData')/ID

Mapping (List of source fieldnamens#target elements in data instance)

PAR_NumValue#ID

Figure 9-26 Increment order number and create XML fragment for order number prepopulation

Settings on this tab create an XML fragment for prepopulation, as shown in Example 9-17.

Example 9-17 XML fragment for order number prepopulation

```
<ID>100647</ID>
```

7. Compare both XML structures for data instance prepopulation with the structure of the XForms data instances in the XFDL template. The root element of the created new content must exactly match the element name addressed in the XPath expression for the data instance to populate. These names and the root element of the created instance data must match, as they are case sensitive (Example 9-18 on page 540).

Attention: Replacing a complete XForms instance, have a look at the root element in the XFDL file. Often you will see here the default structure as:

```
<xforms:instance id=”INSTANCE_1”>
   <data>
      <element1></element1>
      .....
      <elementn></elementn>
   </data>
</xforms:instance>
```

In this case, the XForms path to replace the instance is:

```
instance(’INSTANCE_1’)
```

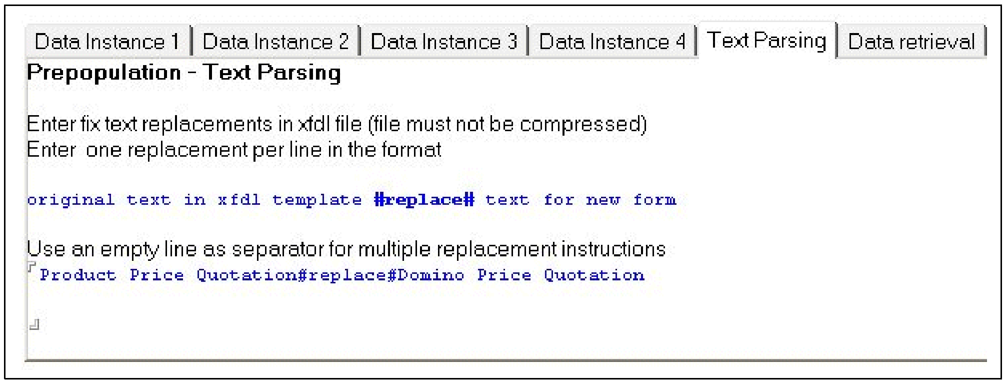
The replacing XML fragment should have the <data> element as root element:

```
<data>
   <element1>value 1</element1>
   .....
   <elementn>value n</elementn>
</data>
```

Example 9-18 XML fragments representing the data instances to prepopulate in XFDL template

```
<xforms:instance id="EmployeeDetails" xmlns="">
                  <EmployeeDetails>
                 <Employee>
                    <FirstName></FirstName>
                      <LastName></LastName>
                      <ID></ID>
                       <ContactInfo></ContactInfo>
                       <Manager></Manager>
                 </Employee>
              </EmployeeDetails>
               </xforms:instance>
              .....
              <xforms:instance id="FormOrderData" xmlns="">
                  <FormOrderData>
                     <ID></ID>
                     <CustomerID></CustomerID>
                     <Amount></Amount>
                     <Discount></Discount>
                     <SubmitterID></SubmitterID>
                     <State>1</State>
                     <CreationDate></CreationDate>
                     <CompletionDate></CompletionDate>
                     <Owner></Owner>
                     <Version>0</Version>
                     <Approver1></Approver1>
                     <AppovalDate1></AppovalDate1>
                     <Approver1Comment></Approver1Comment>
                     <Approver2></Approver2>
                     <AppovalDate2></AppovalDate2>
                     <Approver2Comment></Approver2Comment>
                    <Cost></Cost>
                  </FormOrderData>
               </xforms:instance>a>
               </xforms:instance>
```

8. Switch to the TextParsing tab and enter all necessary changes there (Figure 9-27). In our example we have no real need to change item in the form. Let us change the form title from Product Price Quotation to whatever you like.



Prepopulation - Text Parsing

Enter fix text replacements in xfdl file (file must not be compressed)
Enter one replacement per line in the format

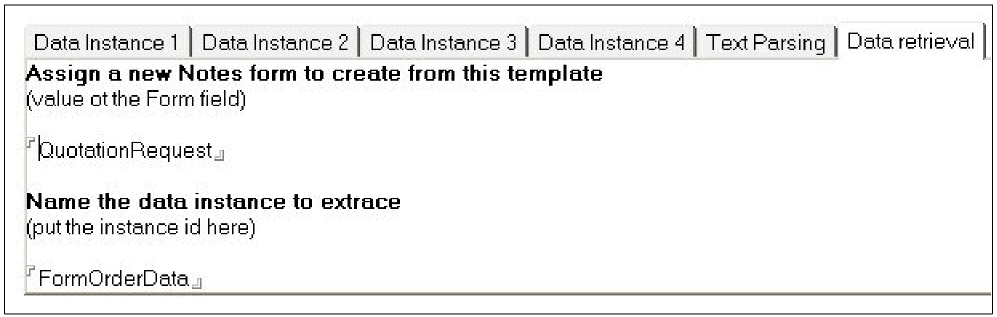
`original text in xfdl template #replace# text for new form`

Use an empty line as separator for multiple replacement instructions

```
Product Price Quotation#replace#Domino Price Quotation
```

Figure 9-27 Text parsing settings

9. Define what data instance to extract. Open the Data retrieval tab and enter the following information. The data extraction functionality is not implemented yet. It will be part of the servlet that we create soon. We apply a simple logic. The servlet should extract all data from one named instance (XML instance or XForms instance) and move the contained data in Notes fields. We assume here that the field names are the same as the element names in the data instance.
10. Assign the instance name FormOrderData, and the Domino form to create is QuotationRequest.



Assign a new Notes form to create from this template
(value ot the Form field)

QuotationRequest

Name the data instance to extrace
(put the instance id here)

FormOrderData

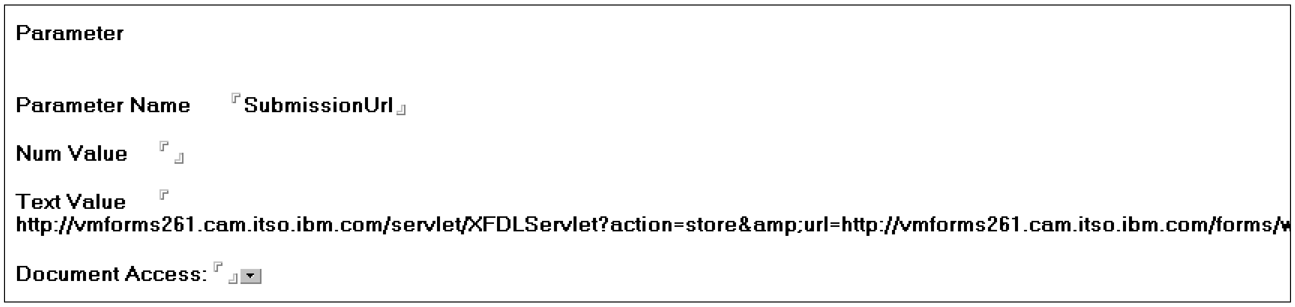
Figure 9-28 Data extraction information

11. Save the document.

Creating parameter documents

Finally, we must create parameter documents containing the environment information for the application. For now, we need one parameter document that stores the URL for the servlet and receives the completed form.

1. Go to the Parameters view and create one parameter document, as shown in Figure 9-29. (Match the parameter name exactly. It is hard coded in the functions updating the ConfigurationInfo instance.)



Parameter

Parameter Name SubmissionUrl

Num Value

Text Value
http://vmforms261.cam.itso.ibm.com/servlet/XFDLServlet?action=store&amp;url=http://vmforms261.cam.itso.ibm.com/forms/w

Document Access:

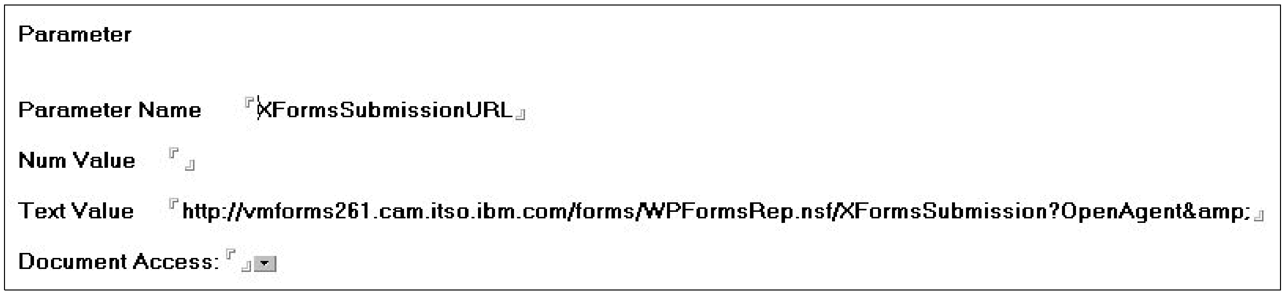
Figure 9-29 Parameter document containing the submission URL

Some comments regarding the newly assigned submission URL are:

```
http://vmforms261.cam.itso.ibm.com/servlet/XFDLServlet?action=store&amp;url=
http://vmforms261.cam.itso.ibm.com/forms/WPForms.nsf
```

The URL points to a servlet running on the Domino server. We create this servlet in the next section. As a parameter (url=), we pass additional information with the submission action. The servlet uses the URL parameter to determine the next page to display after a successful submission. In the example above, we specify the Template Database default page as a Success URL.

2. Create the XFormsSubmissionURL parameter document, as shown in Figure 9-30.



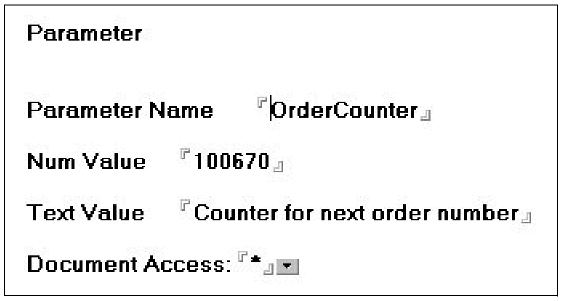
Parameter

Parameter Name	XFormsSubmissionURL
Num Value	
Text Value	http://vmforms261.cam.itso.ibm.com/forms/WPFormsRep.nsf/XFormsSubmission?OpenAgent&amp;
Document Access:	

Figure 9-30 XFormsSubmissionURL parameter document

The stored URL should match the XFormsSubmissionAgent that we created earlier in this chapter. It is stored in the repository database. We must add to the URL the arguments ?OpenAgent&amp;. This allows the form to add the parameters for the operation to execute (read the choices or detail data for customer or items).

3. Create the last element, an OrderCounter parameter document, as shown in Figure 9-31.



Parameter

Parameter Name	OrderCounter
Num Value	100670
Text Value	Counter for next order number
Document Access:	*

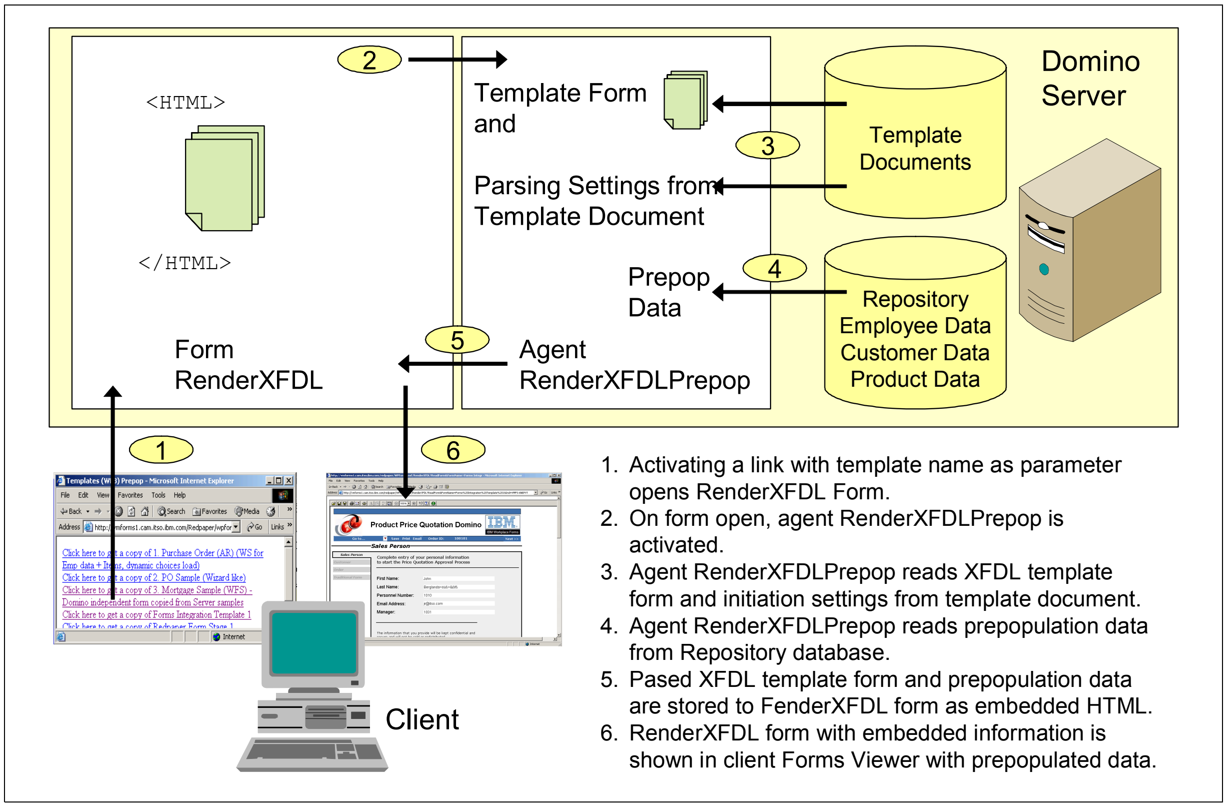
Figure 9-31 Ordercounter parameter document

4. Assign any numeric value to the parameter NumValue field. This is the ID for the first form that we create with the application. With each form created from the template, the @Formula on the second prepopulation tab reads the stored value and increments the NumValue field.
5. Allow all authenticated users to increment the OrderCounter parameter (field Document Access contains a wild card or any group for all authenticated users).

Now all prerequisites are ready to run the example.

Prepopulation test

Let us consider the first test. To get more familiar with the created scenario, have a second look at the overview picture (Figure 9-32).



1. Activating a link with template name as parameter opens RenderXFDL Form.
2. On form open, agent RenderXFDLPrepop is activated.
3. Agent RenderXFDLPrepop reads XFDL template form and initiation settings from template document.
4. Agent RenderXFDLPrepop reads prepopulation data from Repository database.
5. Pased XFDL template form and prepopulation data are stored to FenderXFDL form as embedded HTML.
6. RenderXFDL form with embedded information is shown in client Forms Viewer with prepopulated data.

Figure 9-32 High-level flow in Domino new document scenario

Figure 9-33 provides a more technical view, showing all the main components that we have built so far.

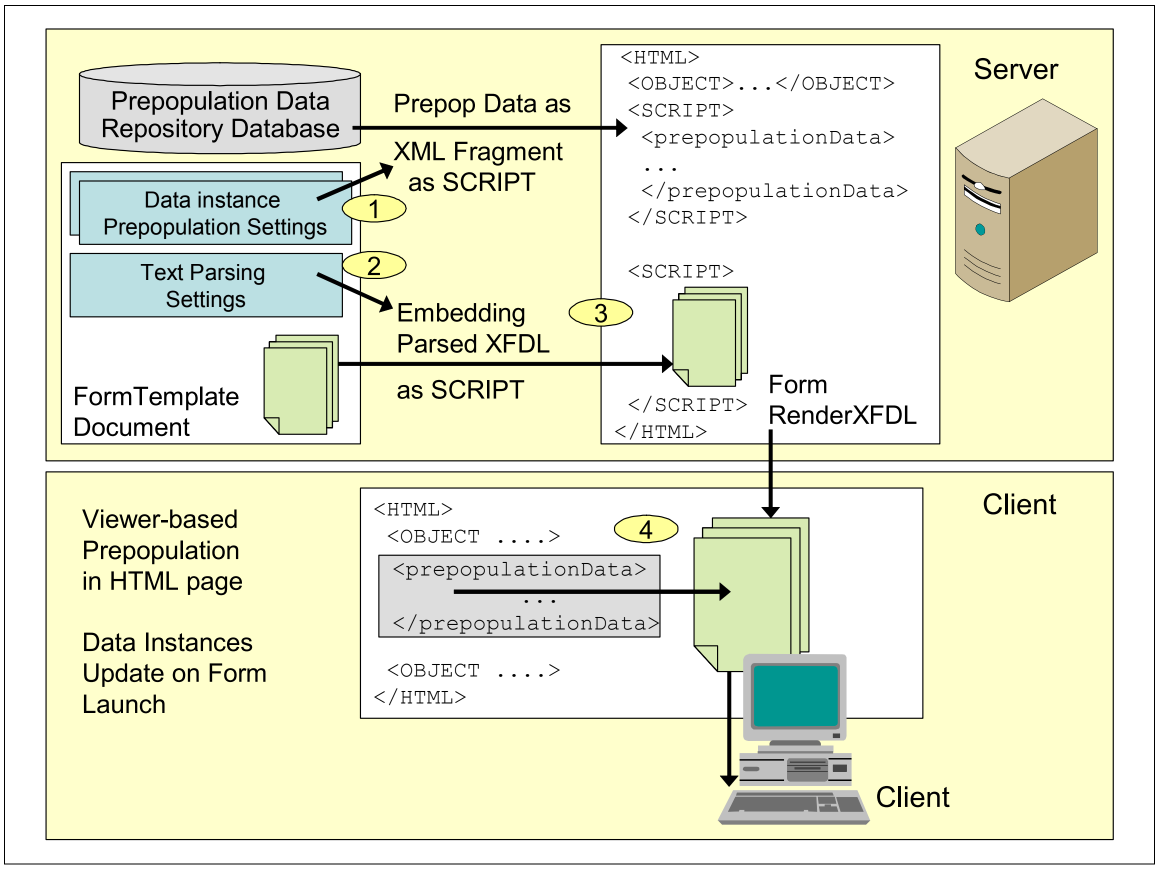


Figure 9-33 Domino prepopulation flow (component details)

To start the prepopulation test, follow the steps below.

1. Open the created **templatesPrepop** view in the template database with a Microsoft Internet Explorer 6 browser and authenticate with one of the created test users in the repository database, as shown in Figure 9-34.
2. Start the application using the browser. Apply any valid URL in your environment to the application. In our test environment this is:

   `http://vmforms261.cam.itso.ibm.com/forms/WPForms.nsf`

3. A login prompt should appear, as shown in Figure 9-34.

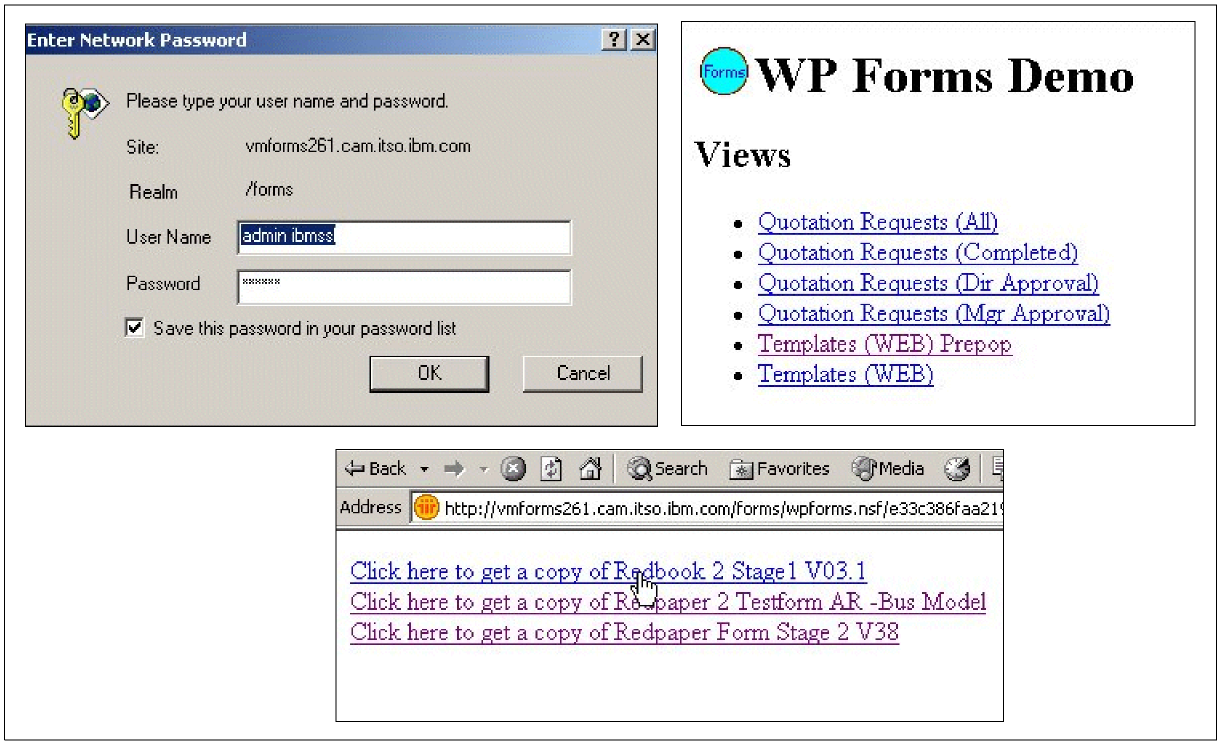

Enter Network Password
Please type your user name and password.
Site: vmforms261.cam.itso.ibm.com
Realm /forms
User Name admin ibmss
Password ******
Save this password in your password list
OK
Cancel
WP Forms Demo
Views
Quotation Requests (All)
Quotation Requests (Completed)
Quotation Requests (Dir Approval)
Quotation Requests (Mgr Approval)
Templates (WEB) Prepop
Templates (WEB)
Back
Search
Favorites
Media
Address http://vmforms261.cam.itso.ibm.com/forms/wpforms.nsf/e33c386faa21
Click here to get a copy of Redbook 2 Stage1 V03.1
Click here to get a copy of Redpaper 2 Testform AR -Bus Model
Click here to get a copy of Redpaper Form Stage 2 V38

Figure 9-34 Login and default page on the created application

4. After login, the default page shows up, exposing views to explore. Navigate to the **Template (WEB) Prepop** view, as shown in Figure 9-34.
5. Depending on the entered template documents, there can be other entries in the view. Check the generated links when moving the mouse over one of these links. They should look like our example:

   ```
   http://vmforms261.cam.itso.ibm.com/forms/WPForms.nsf/RenderXFDL?ReadForm&Form
   Name=Redpaper%20Form%20Stage%201&Ind=VMFS-6NDPF5
   ```

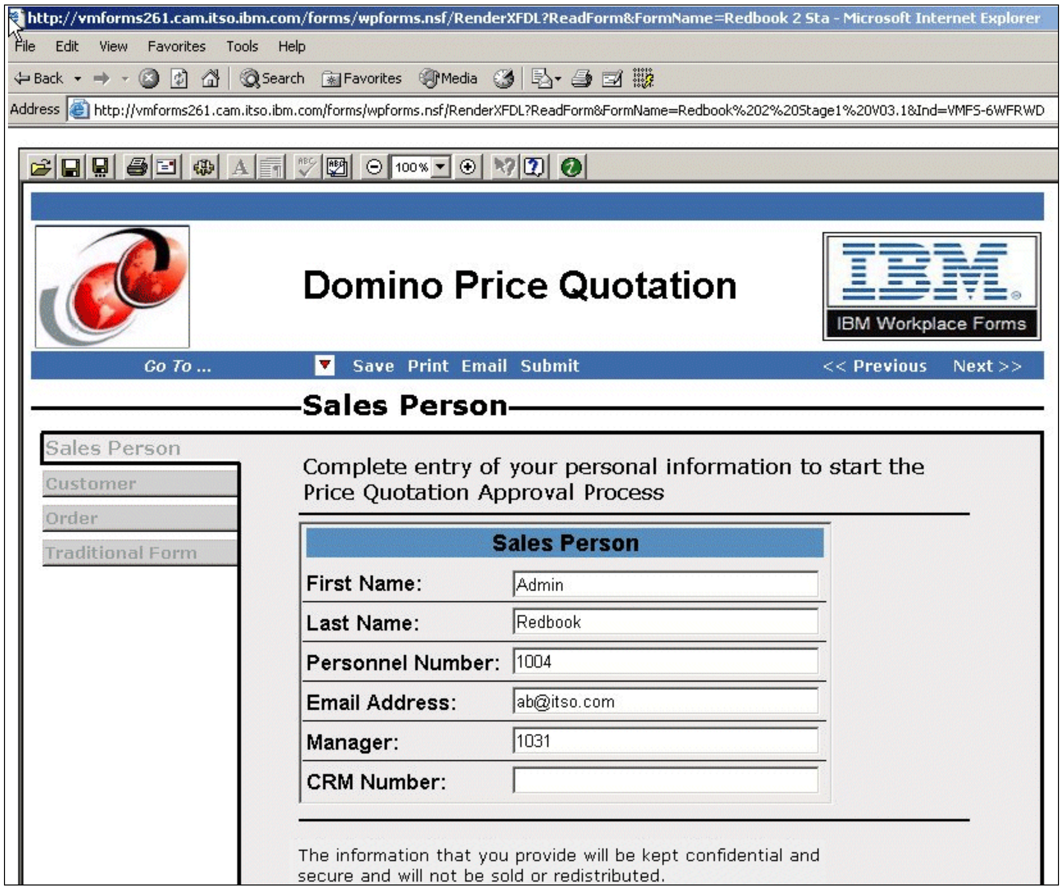
6. Make sure that all required components are OK, as shown in Table 9-7.

Table 9-7 Components creation

Component	Description
`http://vmforms261.cam.itso.ibm.com`	URL to the Domino server
`forms/WPForms.nsf`	Path to template database
`RenderXFDL?ReadForm`	Form name RenderXFDL and ReadForm URL command

Component	Description
`FormName=Redpaper%20Form%20Stage%201`	Parameter FormName referencing the form name when opening RenderXFDL form
`Ind=VMFS-6NDPF5`	Arbitrary parameter to prevent caching changing for each link in the view

7. Assuming that you created one person in the repository database with your Notes name applied, the information related to this entry should show up, as in Figure 9-35.


http://vmforms261.cam.itso.ibm.com/forms/wpforms.nsf/RenderXFDL?ReadForm&FormName=Redbook 2 Sta - Microsoft Internet Explorer

Address http://vmforms261.cam.itso.ibm.com/forms/wpforms.nsf/RenderXFDL?ReadForm&FormName=Redbook%202%20Stage1%20V03.1&Ind=VMFS-6WFRWD

Domino Price Quotation

Sales Person

Complete entry of your personal information to start the Price Quotation Approval Process

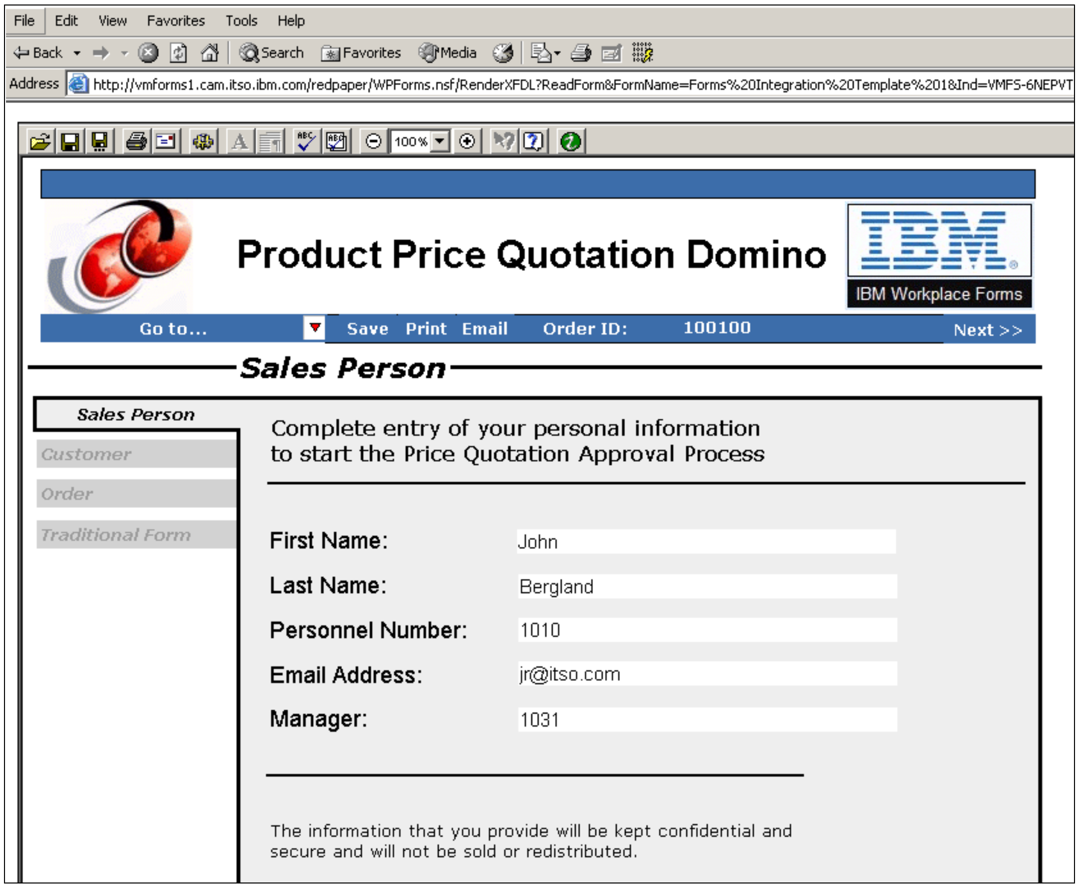
Sales Person

First Name:	Admin
Last Name:	Redbook
Personnel Number:	1004
Email Address:	ab@itso.com
Manager:	1031
CRM Number:	

The information that you provide will be kept confidential and secure and will not be sold or redistributed.

Figure 9-35   First created form - Sales Person wizard

8. Click the link **Click here to get a copy of Forms Integration Template 1** for the document created in this chapter. A new page should pop up and show the Forms Viewer embedded in an HTML page (Figure 9-36).


File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://vmforms1.cam.itso.ibm.com/redpaper/WPForms.nsf/RenderXFDL?ReadForm&FormName=Forms%20Integration%20Template%201&Ind=VMFS-6NEPVT
100%
IBM Workplace Forms
Go to... Save Print Email Order ID: 100100 Next >>
Sales Person
Customer
Order
Traditional Form

Product Price Quotation Domino

Sales Person

Complete entry of your personal information to start the Price Quotation Approval Process

First Name:	John
Last Name:	Bergland
Personnel Number:	1010
Email Address:	jr@itso.com
Manager:	1031

The information that you provide will be kept confidential and secure and will not be sold or redistributed.

Figure 9-36 Viewer with prepopulated form embedded in an HTML page

9. Notice the small space between the browser's address bar and the Viewer. Right-click there and review the source code of the page. In summary, the HTML page created for a new form with prepopulation is shown in Example 9-19. This is a snapshot taken with the source preview functionality of the browser. It shows the page on load (just before the contained objects start to execute any action).

Example 9-19 Complete HTML page prepopulating an XFDL form

```
<HTML><BODY>
<!-- the outer object supports MS IE - the inner object supports Firefox, Mozilla & Co. -->
<OBJECT id="XFDLForm" height="2000" width="980" border="1"
classid="CLSID:354913B2-7190-49C0-944B-1507C9125367">
   <PARAM NAME="XFDLID" VALUE="theForm">
   <!-- red lines are hidden, when no prepopulation data available
(PrepopulationDocUNID_x="") -->
   <PARAM NAME="instance_1" VALUE="EmployeeDetails xforms;
replace=&quot;instance('EmployeeDetails')/Employee&quot;">
   <PARAM NAME="instance_2" VALUE="FormOrderData xforms;
replace=&quot;instance('FormOrderData')/ID&quot;">
   <PARAM NAME="instance_3" VALUE="ConfigurationInfo xforms;
replace=&quot;instance('ConfigurationInfo')&quot;">
     <!--[if !IE]>-->
```

```
         <OBJECT ID="ObjectForFF" height="2000" width="980" border="1"
type="application/vnd.xfdl">
   <PARAM NAME="XFDLID" VALUE="theForm">
   <!-- red lines are hidden, when no prepopulation data available
(PrepopulationDocUNID_x="") -->
   <PARAM NAME="instance_1" VALUE="EmployeeDetails xforms;
replace=&quot;instance('EmployeeDetails')/Employee&quot;">
   <PARAM NAME="instance_2" VALUE="FormOrderData xforms;
replace=&quot;instance('FormOrderData')/ID&quot;">
   <PARAM NAME="instance_3" VALUE="ConfigurationInfo xforms;
replace=&quot;instance('ConfigurationInfo')&quot;">
          </OBJECT>
     <!--<![endif]-->
</OBJECT>
<SCRIPT id=EmployeeDetails type="application/vnd.xfdl; wrapped=comment">
<!--<Employee>
      <FirstName>Admin</FirstName>
      <LastName>Redbook</LastName>
      <ID>1004</ID>
      <ContactInfo>ab@itso.com</ContactInfo>
      <Manager>1031</Manager>
   </Employee>-->
</SCRIPT>
<SCRIPT id=FormOrderData type="application/vnd.xfdl; wrapped=comment">
<!-- <ID>100670</ID>-->
</SCRIPT>
<SCRIPT id=ConfigurationInfo type="application/vnd.xfdl; wrapped=comment">
<!-- <ConfigurationInfo>

<XFDLSubmissionURL>http://vmforms261.cam.itso.ibm.com/servlet/XFDLServlet?action=store&amp;
url=</XFDLSubmissionURL>

<XFormsSubmissionURL>http://vmforms261.cam.itso.ibm.com/forms/WPFormsRep.nsf/XFormsSubmissi
on?OpenAgent&amp;</XFormsSubmissionURL>
      <FormID>8174F1CBE3BD07C1C1257243006B5896</FormID>
      <DbPath>forms\wpforms.nsf</DbPath>
      <DominoForm>QuotationRequest</DominoForm>
      <InstanceID>FormOrderData</InstanceID>
   </ConfigurationInfo>-->
</SCRIPT>

 <SCRIPT language="XFDL" id="theForm" type="application/vnd.xfdl; wrapped=comment;
next-chunk=Part1">
<!--<?xml version="1.0" encoding="UTF-8"?>
<XFDL xmlns:custom="http://www.ibm.com/xmlns/prod/XFDL/Custom"
xmlns:designer="http://www.ibm.com/xmlns/prod/workplace/forms/designer/2.6"
xmlns:ev="http://www.w3.org/2001/xml-events"
xmlns:xfdl="http://www.ibm.com/xmlns/prod/XFDL/7.0"
xmlns:xforms="http://www.w3.org/2002/xforms" xmlns="http://www.ibm.com/xmlns/prod/XFDL/7.0"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <globalpage sid="global">
      <global sid="global">
         <designer:date>20061129</designer:date>
         <formid>
            <title></title>
            <serialnumber>6C5C03FEF93AD7BB:-5F10736E:10F371E2336:-8000</serialnumber>
            <version>1.0.0</version>
         </formid>
         <designer:version>2.6.1.398</designer:version>
         <xformsmodels>
            <xforms:model>

               <!-- Form Configuration Parameters -->
               <xforms:instance id="ConfigurationInfo" xmlns="">
<ConfigurationInfo>
<XFDLSubmissionURL>http://vmforms261.cam.itso.ibm.com/servlet/XFDLServlet?action=store&amp;
url=</XFDLSubmissionURL>
<XFormsSubmissionURL>http://vmforms261.cam.itso.ibm.com/forms/WPFormsRep.nsf/XFormsSubmissi
on?OpenAgent&amp;</XFormsSubmissionURL>
<FormID>DBD81B45138A8CC2C125724000101DEF</FormID>
<DbPath>forms\wpforms.nsf</DbPath>
<DominoForm>QuotationRequest</DominoForm>
<InstanceID>FormOrderData</InstanceID>
</ConfigurationInfo>
</xforms:instance>-->
</SCRIPT>

<SCRIPT language="XFDL" id="Part1" type="application/vnd.xfdl; wrapped=comment;
next-chunk=Part2">
<!--

.......
               <!-- Detail Data for the Indicated Employee (previously FormOrgData)-->
               <xforms:instance id="EmployeeDetails" xmlns="">
                  <EmployeeDetails>
                   <Employee>
                      <FirstName></FirstName>
                      <LastName></LastName>
                      <ID></ID>
                       <ContactInfo></ContactInfo>
                       <Manager></Manager>
                   </Employee>
                Employee</EmployeeDetails>
               </xforms:instance>
.........
            </xforms:model>
         </xformsmodels>
      </global>
   </globalpage>
   <page sid="Wizard_Sales_Person_Info">
      <global sid="global">
         <label>Wizard_Sales_Person_Info</label>
         <designer:pagesize>800;600</designer:pagesize>
      </global>
......
.......
<SCRIPT language="XFDL" id="Part112" type="application/vnd.xfdl; wrapped=comment;
next-chunk=Part113">
<!--
         <mimedata
encoding="base64-gzip">H4sIAAAAAAAAO3Tiz/TiwIA8N/EDOnsYpr343hslFfmkR4kbw61xchjJmMqr5lH6hjT
6JJDZpIR
wsbYWcusOLmjLB3vlEbenZOQxIlJOrn3z7ifz/n+D18PL3cHx8hCwA2QAgAUCoXD4QYGBkgkOtra
2tHR8dSpU97e3mfPngOJCYmKirp48SKJRMrMzMzNzSOsLKTT6Uwms6GhobW1VSAQPH78WCwWDwON
jY+Pz8zMLC4urq2tSaXS7//4x/+DQ8B//e8CANkDHFPgnryabipE1SyOj1f7JA/6o8pL/ft1vQXw
I4R6tnWtc46eHO2DFf8P5xJTrObbplvG3mVW6NTQvqRG3wMOpOWp5w9Yw3edqcuXiKqRfpWG5Pg5
XhsR3ehvf7rqd7W4c01BTUcH4wTLI7fdnLRX2ZhmjLLWSJ1fP2M1RBDzpoesJW2d6kx9gx9EHvkg
KTQcjhspphv99IRWauY+IFyff1Z8OIPm+zlJkp1lvXCsErSP1l+jsSFXNYEfaquyhIKDPOVF8LiR
wurBjqOVyY2k4UOHrXngYXULhG7HEWHSQpGpnv8J5ntRg+XljaKHwa4xSjAbo7AOfudf5XORe7QO
```

```
5G+7faUjlv5Z6TvS64oH7eAErY7fVppxKG4a9jFJToljjYJ7ywYScNkQXTYuZ14j6OXPdfMXdMDq
2JqqSGqOlYSmnfp+Pk+fhjDMxwrsJuM1N9NcEjcUjLBgKzHibaHteOzbmw4vHOBp+g2mOriAsPIw
z1erkNclKQZNF275WiwZnc+DyU5nwF3en5GPifxULbeR/XmMHn658eVtVgmSUBFb7cVOwb+LKSmD
bHrMF5sqm76sSn+ngfGNWGJpoK3wpqFVBFgIAoPVaWYH5x8tQ9wrOGFGrAvPmMB7JPKRc2SARmeQ
a+IQzezxEsUodmPjv5eb7/FD4th7PJXU2Rvn7rRXFB8cd1zgdmOtc/KOXdGIboWdYxmnhilyFvkD
yxXhl8riMSOUzRYsCNzxnFDZLhwdX2OfucKB/jxxgk7OIRK/RJRDVN7H+6ypm1hGfQ4hJHQVwkxO
OfGnUrhM2IWYJXScinZjN9owlNCjxGr6VIHmPw97pPzNvKZjfRMbV6Sd9mH9md2B2AUerHsiHGye
nDHLqiFIamkWJAipX2voGGnA9u3VI4N2rwsDU655X+DnvsILJ/vOhDWkvPC1XEOZCzh5mMxjnCVa
nDYzzBy51p5ODR2xmOEXLRHcnCYzTygO6o6SDoTMvnE7zkl1tWjsNJ6YrVic3kvPXKmyz6BIpOMm
9zaESOyP4dcfFgrtfOrGfzOTrb1vTmhZ//V2DPcLV9XnS7qrxumHS4znQ/KcJharaGe5WTiOs8IV
tpxv+8HLWYg5Fc4j36Ntffy6JpK33P3UM3ZlylX1dP5kJmzX2JKq5P7Dt88vgiLmXP51ErPzkT1Y
YT41R3XnunYJ8ta35ln+gYuwXzIfjqpxLLMSytv1TBlLgfmrZZeG1rKYYh9PIl/c8DUSmVRZO/n9
Dw+n5xm5+6jE8+126GzwfkXTg+ki2RGh6BMqgNKpNZ3F9FChO1IArQGRrC6PAmFyqJ6RehCUXPdK
gH4S9YFIVsUKUMDgQHvyiUD7gvwT4Rd26FCnJPOQEKWMBWQgUEBJVT97G3o/f+vMnIvYkKWoDM1R
S6eAZGoACNu9AOs7e6cwp2OWF5OlMAGADRMBOH5ARkM/VHPxoC1V2/iizD59sH4AILOfAqh5jsOk
cM3j6vUmCik/XuOhi5QQFEAB5wwCB2S72WxcHu1RNip7aBHrEiCzHOfZpw+A5C/xS8cLjDcJyH7s
zIEb5OZaKaFUXQFnI6N2h2IO4rkoOVBAyrGATVmFL+EoqWLY18S23GuQEDhWMfrOHYqFHIxPHQOp
5kfoWb-->
</SCRIPT>

<SCRIPT language="XFDL" id="Part113" type="application/vnd.xfdl; wrapped=comment;">
<!--sipLJ5F6BPnUUWxc/2YOR58G16zLGxigx8TbVOry3mxFKT/9WFOrtAFevkV2RADph+V7MD
H7Ube5R+DpECXgrXreTXpde9w9hM3i6Krx/VINveO1Ym9uFta9yO3jIUq6jtQGHGDJMASyvUy5Cr
9mMzrzCNok5ibUoco/KKTabqmTOi34WCa9OrbLpXXFd1uWW9DarJ79zyxamgkwM8v4Dq3fpAY3Wd
Hkkr/byyOTndqFgAUcjD+3G+OhoYUY/8WhPDON529RZO8SbXwMjT6VVwtkdw76+UaW/cdzNJj8oW
j+rXEgkrkPQqtjvoxC7KmVhlz2G3+Mj+S9dtCyYGr7Q/qPmzJfakO+TIra22Rr/LRBSnCvHn6E2J
ghgrQli9mQyktAsFh+PTOG9m3mOJu+S4CVSfqXnNoId9yh8TvpOylabGPOKyS2Lu+Ewv29k7jAss
Uh/4TK8mC5NnH8en9zqFryW/7ppwSOjjcBrQOWuHG2Rijzsdifgymxz3s3ft2l/9s992gv4DfEyg
rJ6fRa/22YRHBw/g3JsZ1undONTEXL1D84ro7R7VId511NRc5Wovir+gs+7uu6BSufOUAQ6/HZ5z
9tmj7V6rImt/Ef94aegvDAdudFFaS5Sco6kBCAQ4/Q3WC2ml2wkAAA==</mimedata>
      </data>
      <spacer sid="vfd_spacer">
         <itemlocation>
            <x>960</x>
            <y>1260</y>
            <width>1</width>
            <height>1</height>
         </itemlocation>
      </spacer>
   </page>
</XFDL>-->
</SCRIPT>


<BODY>
</HTML>
```

Be aware of the following aspects of the prepopulation test:

- Inspect the embedded object for IE with the nested object for Mozilla.
- Inspect the create prepopulation <PARAM> elements and corresponding <SCRIPT> elements.
- Search for the chunk information (for demo purpose we reduce the chunk size to 2000 byte).
- Inspect the ConfigurationInfo instance in the document. All URLs and settings are already in place (due to text parsing in an uncompressed form).
- Inspect the values for EmployeeDetails in the prepopulation scripts and the form. The values in the form are empty, because the internal computing engine of the Viewer does

not process any update scripts after the document load. In the opened browser this information shows up a second after page load.

Tip: If there are any errors during the opening of the document, try the following:

1. Make a copy of the template document in the Notes client.
2. Give it a new name (such as TEST).
3. Remove all information from the prepopulation tabs (no data instances to prepopulate, no text parsing).
4. Save the form.
5. Open the TemplatesPrepop view in the browser as before.
6. Do a browser refresh if the new form is not visible.
7. Try to create a new copy from the template in the browser using this new test form.
8. This should work, but if not:
   a. Inspect the rendered HTML.
   b. Look for missing or additional fragments.
   c. Review the RenderXFDL form design and RenderXFDLPrepop agent design to make things work.
9. If this works, add the prepopulation information step-by-step, back to the TEST form document. After completing one prepopulation tab, save the form and try to open it in the browser. The following errors for prepopulation are common:
   – The @Formula reading the UNID from the source document is not OK or the view used for lookup does not match. Repair this.
   – Data instance names do not match. Double-check for this.
   – Field names or element names assigned in the Mapping field are misspelled. Triple check for this.
   – Make sure the agent has sufficient execution rights and is running as a Web user. (Otherwise we cannot get the user name from the session. Inspect the Domino log).
10. Enter text parsing settings step-by-step. Special characters in the text parsing tab will break the form:
    a. Enter the available replacements one after another and do a test after each new entry.
    b. After each new entry, save the form and do a new test in the browser.

Finally, after all this troubleshooting, everything should work properly.

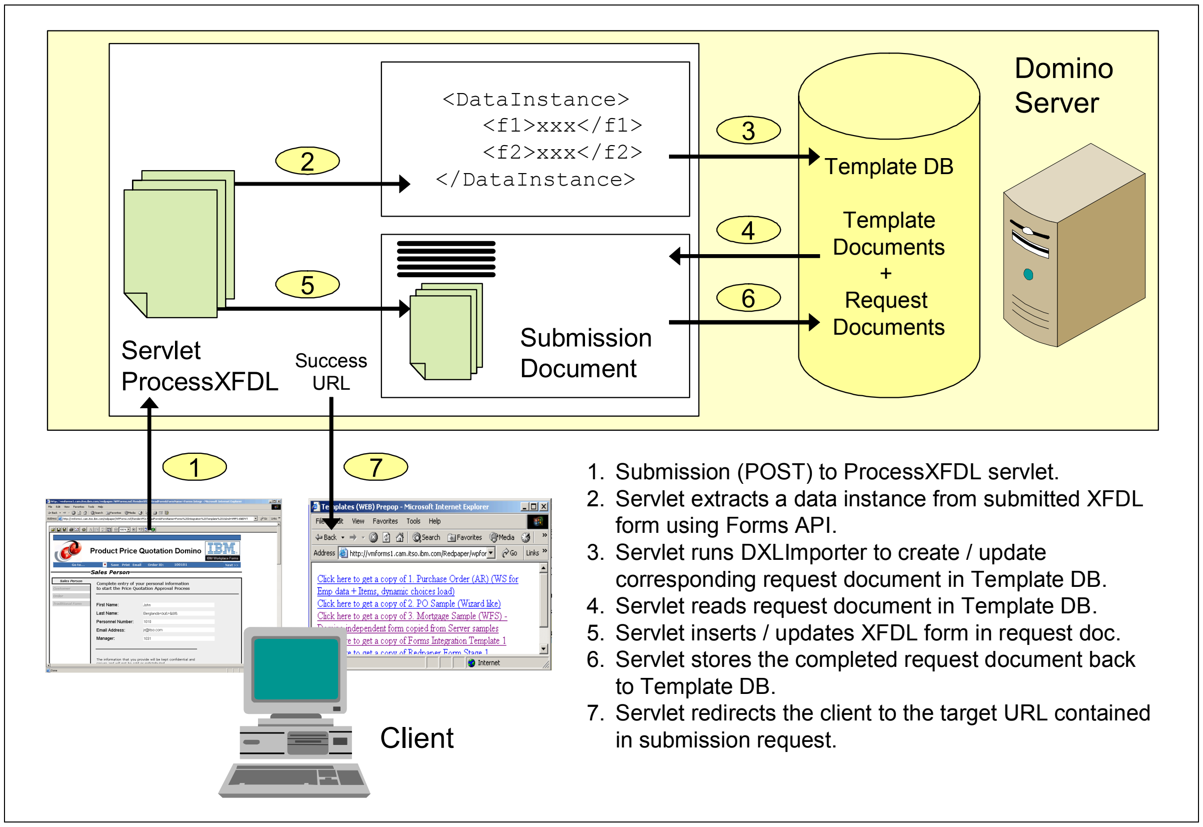
9.6.3 Template database: receiving submitted forms in Domino

A submitted form is passed to the server as content in POST requests. Domino can receive POST requests by running an agent and retrieving the content using CGI variables. Unfortunately, there are limitations to the size of the information received. A CGI variable can only store messages with up to 30,000 characters. For bigger submits, other techniques must be implemented.

This is the point where a servlet comes into the game. Basically, we have two benefits from using a servlet to receive POST messages:

- ► There is an unlimited length for the contained data.
- ► Using Java, we can utilize all benefits coming with the Forms API.

Figure 9-37 shows the main components engaged in receiving submitted documents.


Domino Server
Template DB
Template Documents + Request Documents
<DataInstance> <f1>xxx</f1> <f2>xxx</f2> </DataInstance>
Submission Document
Servlet ProcessXFDL
Success URL
Client
1
2
3
4
5
6
7

1. Submission (POST) to ProcessXFDL servlet.
2. Servlet extracts a data instance from submitted XFDL form using Forms API.
3. Servlet runs DXLImporter to create / update corresponding request document in Template DB.
4. Servlet reads request document in Template DB.
5. Servlet inserts / updates XFDL form in request doc.
6. Servlet stores the completed request document back to Template DB.
7. Servlet redirects the client to the target URL contained in submission request.

Figure 9-37 Flow on form submission to Domino

To build this scenario, we have to create the following components:

- ► The receiving servlet named ProcessXFDL, and accordingly the deployment information (servlets.properties file on Domino server)
- ► A form in the template database capable of storing the incoming documents along with the extracted metadata (QuotationRequest documents)
- ► A maintenance view for these documents
- ► A lookup view for the servlet to find the corresponding request document for the incoming XFDL form on the server (if there is any)

Now let us build these components.

ProcessXFDL servlet receiving incoming XFDL documents

Building the servlet can be done using Eclipse, RAD6, or any other Java development environment. The servlet is contained in a single Java file. There is some basic information needed to configure the servlet. This can be done in the servlet.properties file, or it can be read from the incoming XFDL document (or from any other data source). What portion of information comes from what data source depends on the environment and design guides in place. In this book we read from the servlet.properties file:

- User name and password to access a remote server
- The field name of where to store the XFDL file as attachment

The following information is stored in the ConfigurationInfo instance in the incoming XFDL form:

- Path to target database
- Form name to create
- Document XFDLID to update in subsequent submissions the one and the same form

Note: The servlet.properties file can store multiple virtual addresses for the same servlet and assume, for each virtual address, different parameters. This makes it possible to use one generic servlet processing different XFDL forms.

Tip: Having a clear decision, the servlet to create will run on the Domino server, and we can think of storing the main servlet configuration in a Domino database as well.

The servlet should process the following tasks:

- Read setup information (init method). Since our setup information is static (stored in the servlet.properties file), we can read it in the init method.
  - Identify the database, form, and field name to store the request document.
  - Connect to the database (using user name/password).
  - Detect the data instance ID to extract from the incoming XFDL form.
- Receive incoming POST messages (this is done in the doPost method):
  - Extract the Success URL from the incoming message (URL parameter).
  - Read the incoming XFDL form.
  - Extract the ID of the instance from the form.
  - Extract the assigned data instance from the XFDL file using the Forms API.
  - Read the custom target parameters. (XFDLID is the key to search for a related request document in the target database.)
  - Prepare the XML stream for the DXLImporter for document creation/update with the extracted data instance.
  - Run the DXLImporter to create/update the request document.
  - Store the received XFDL file to the just-created/updated request document as an attachment.
  - Submit the Success URL to the browser.
- Receive GET messages (for debug purposes only). The doGet method submits the settings read from the servlet.properties file rendered in an HTML page.

The full servlet code is given in Example 9-20. For details see the in-line comments.

Example 9-20 Listing of full servlet code

```
/**
 * @version 1.0
 * @author Cees Vandewoude, Andreas Richter
 * @comment Improved simple servlet version for IBM Workplace Forms 2.6.1 Integeration
 *          Redbook
 */

import java.io.*;
import javax.servlet.*;
import javax.servlet.http.*;
import lotus.domino.*;
import java.util.Vector;

import com.PureEdge.DTK;
import com.PureEdge.xfdl.FormNodeP;
import com.PureEdge.xfdl.XFDL;
import com.PureEdge.IFSUserData;
import com.PureEdge.IFSUserDataHolder;
import com.PureEdge.error.UWIException;
import com.PureEdge.IFSSingleton;

public class ProcessXFDL extends javax.servlet.http.HttpServlet implements
      javax.servlet.Servlet {
   // field to store the request
   String targetField;

   //  file name for the created attachment containing the POST data
   String fileName;

   // debug mode (will print to console, if set to "on"
   static String debugMode;

   // content type for incoming message. Will be assigned to the mime entity
   String contentType;

   // username to create domino session and access target database
   String userName;

   String password;

   // servlet name
   static String sv;

   //Custom value for flag parameter in .readForm API call
   private static final int READFORM_XFORMS_INIT_ONLY = (XFDL.UFL_SERVER_SPEED_FLAGS &
         (~XFDL.UFL_XFORMS_OFF) | XFDL.UFL_XFORMS_INITIALIZE_ONLY);


   public void init(ServletConfig config) {
      // Read servlet configuration parameters
      try {
         super.init(config);

         sv = this.getClass().getName();
         //read values from servlets.properties
         debugMode = config.getInitParameter("debugMode");
         if (debugMode == null)
```

```
            debugMode = "on";
         if (!(debugMode.equals("on")))
            debugMode = "off";
         debugOut(" debugMode: '" + debugMode + "'");

         targetField = config.getInitParameter("targetField");
         if (targetField == null)
            targetField = "Body";
         if (targetField.equals(""))
            targetField = "Body";
         debugOut(" field name for request: '" + targetField + "'");

         userName = config.getInitParameter("userName");
         if (userName == null)
            userName = "";
         debugOut(" userName: '" + userName + "'");

         password = config.getInitParameter("password");
         if (password == null)
            password = "";
         debugOut(" password: '" + password + "'");

         fileName = config.getInitParameter("fileName");
         if (fileName == null)
            fileName = "post#ID#.txt";
         if (fileName.equals(""))
            fileName = "post#ID#.txt";
         debugOut(" file name for POST attachment: '" + fileName + "'");

         contentType = config.getInitParameter("contentType");
         if (contentType == null)
            contentType = "text/plain";
         if (contentType.equals(""))
            contentType = "text/plain";
         debugOut(" contentType for created attachment: '" + contentType
               + "'");

         System.out.println(sv + " initialized");

      } catch (javax.servlet.ServletException e) {
         e.printStackTrace();
      }
   }

   public void doGet(HttpServletRequest request, HttpServletResponse response) {
      //this method is optional for basic servlet functionality in this
      // context.
      //we will return only some state information - this option is useful
      // for debugging
      try {
         response.setContentType("text/html");
         PrintWriter out = response.getWriter();
         out
         .print(sv
               + ": The url must be called with a POST action containing a valid XFDL
document <BR>");
         out
         .print("A GET request dies not accept any parameters and return the actual
servlet state only <BR>");
         out.print("<BR>");
```

```
            out.print("<BR>");
            out.print("<H2>Servlet Status and Statistics Report" + "</H2>");
            out.print("ServletClass: " + sv + "<BR>");
            out
            .print("<H3>Session parameters currently set for this web service proxy servlet
in servlets.properties</H3>");
            out.println(" userName: '" + userName + "'" + "<BR>");
            //out.println(" password: '" + password+ "'" + "<BR>");
            out.println(" target field: '" + targetField + "'" + "<BR>");
            out.println(" attachment file name: '" + fileName + "'" + "<BR>");
            out.println(" content type: '" + contentType + "'" + "<BR>");
            out.println(" debugMode: '" + debugMode + "'" + "<BR>");

         } catch (IOException e) {
            // Something went wrong.
            e.printStackTrace();
         }
      }

      public void doPost(HttpServletRequest request, HttpServletResponse response)
      throws IOException {

         // initi params for Forms API
         FormNodeP theForm = null;
         String dbPath="";
         String dominoForm ="";
         String instanceID = "";
         String nextUrl = "";
         DxlImporter importer = null;

         // values from the calling url (parameters)
         // url to process, when the transaction is finished

         response.setContentType("text/html");
         ServletOutputStream out = response.getOutputStream();
         ServletInputStream theStream = request.getInputStream();
         boolean isNew = true;
         //try to get the next url from the request for client redirection
         nextUrl = request.getParameter("url");
         if (nextUrl == null)
            nextUrl = "";
         debugOut(" next url: '" + nextUrl + "'");

         out.println("<HTML><B>Submitting eform</B><BR>");

         try {
            //Initialize Forms API
            DTK.initialize("WPForms 2.6.1 Integration Redbook", "1.0.0", "7.0.0");

            XFDL theXFDL;
            theXFDL = IFSSingleton.getXFDL();
            //get the form in a String
            debugOut(" read theForm");
            // Load the form
            XFDL theXFDL = null;
            theXFDL = IFSSingleton.getXFDL();
            p(  "IFSSIngelton OK");
             if(theXFDL == null) throw new Exception("Could not find interface");
         try {
            FormNodeP theForm = theXFDL.readForm(str,READFORM_XFORMS_INIT_ONLY);
         } catch (UWIException e) {
            Object[] tokens = { (e.getStackTraceString()) };
            String message = MessageFormat.format(pattern, tokens);
            p( "ERROR: " + message);
            p( e.toString());
            NotesThread.stermThread();
            }
            debugOut(" theForm created");

            //get entire form as String
            String formString = getFormAsString(theForm);
            debugOut(" form stored to formString");

            //here we can read additional xfdl elements like this
            // form=theForm.getLiteralByRefEx(null,"global.global.custom:dominoForm",
            // 0, null, null);

            //read xdfl form id to check, wether we already have the document
            // in the database
            String formID = theForm.getLiteralByRefEx(null,
                  "global.global.custom:formid", 0, null, null);
            if (formID == null) formID = "";
            debugOut(" Form ID from global.global.custom:formid: " + formID);

            if (formID.equals("")) {
               // may be we got an xforms enabled form ->
               //read all values from the ConfigurationInfo instance
                  StringWriter sw = new StringWriter();
                   //try to extract an XForms instance (2.6 compatible)
                   String inst =  "instance('ConfigurationInfo')/";
                   formID = extracXFormstInstance(theForm, inst+"FormID", "FormID");
                   dbPath = extracXFormstInstance(theForm, inst+"DbPath", "DbPath");
                   dominoForm = extracXFormstInstance(theForm, inst+"DominoForm",
                        "DominoForm");
                   instanceID = extracXFormstInstance(theForm, inst+"InstanceID",
                        "InstanceID");
               } else {
               //the form is not xforms enabled -> read the values from
                  global.global section
               dbPath = theForm.getLiteralByRefEx(null, "global.global.custom:dbpath", 0,
                     null, null);

               //get the form settings when a new document must be created
               dominoForm = theForm.getLiteralByRefEx(null,
                  "global.global.custom:dominoform", 0, null, null);

               //get the data instance to extract data
               instanceID = theForm.getLiteralByRefEx(null,
                     "global.global.custom:instanceid", 0, null, null);
               }
            debugOut("dbPath: "+ dbPath);
            if (dbPath == null)
               formID = ""; //ok no dbPath given - try current db

            if (formID == null)
               formID = ""; //ok no ID given - we can only insert a new doc
            debugOut(" Domino Form: " + dominoForm);

            if (instanceID == null)
               instanceID = ""; //ok no ID given - we can only insert a new doc
```

```
          debugOut(" Instance ID: " + instanceID);

          //prepare piped streams to redirect xfdl data to inputstream
          PipedOutputStream po = new PipedOutputStream();
          PipedInputStream pi = new PipedInputStream(po);
          //extract data instance from xfdl as stream

          try{
             //try to extract XML instance (2.5 compatible)
             debugOut ("try extraxt xml instance: " + instanceID );
             theForm.extractInstance(instanceID, null, null, po, 0, null, "[0]",null);
             debugOut(" xml data instance extracted");
          } catch (UWIException euwi) {
             //ok - did not work (instance not found) -> try to extract an
                // XForms instance (2.6 compatible)
             try{
                String strPath= "instance('" + instanceID + "')";
                debugOut ("try extraxt XForms instance: " + strPath );
                theForm.extractXFormsInstance(null, strPath ,false, true, null, po);
                debugOut(" xforms instance extracted");
             } catch (UWIException euwi2) {
                //here we go, if nothing was found
                System.out.println("=====================");
                System.out.println("XML Error:");
                System.out.println(euwi.getMessage());
                System.out.println("XForms Error:");
                System.out.println(euwi2.getMessage());
                euwi2.printStackTrace();
                System.out.println("=====================");
                out.println("<br>Unable to extract data<br><br>");
                if (!nextUrl.equals("")) out.println("<a href=\"" + nextUrl+"\">Return to
application home page</a>");
                out.println("</body></html>");
                return;
             }
          }
          po.flush();
          //read extracted instance to String piStr
          String piStr = getString(pi);
          debugOut(" stream: " + piStr);

          //destroy form to free memory
          theForm.destroy();
          debugOut(" form destroyed");

          //OK - now we can analyse the extracted data and store the form in
          // a document
          try {
             //set up notes connection
             NotesThread.sinitThread();
             Session s = NotesFactory.createSession();
             debugOut(" Notes session created");
             Database db = s.getDatabase(null, dbPath);
             View vw = null;
             Document doc = null;
             Document docAtt = null;
             debugOut(" Notes db found");

             //get target db replica ID for DXLImporter
             String replID = db.getReplicaID();
```

```
//search for a document with the assigned formID in the
// database
String UNID = "";
if (!(formID.equals(""))) {
   vw = db.getView("AllByXfdlId"); //special server viey by
   // formID
   doc = vw.getDocumentByKey(formID, true);
   if (!(doc == null)) {
      //we have found a document -> update it
      UNID = doc.getUniversalID();
      isNew = false;
      //first update the attachment - update after importer
      // action will destroy the field update
      createAttachment(doc, fileName, targetField, s,
            theStream, contentType);
      doc.save(true);
   } else {

   }
}

// prepare DXLImporter for field update
Stream stream = s.createStream();
//createImporterXML composes an xml string for DXLImporter to
// insert/update a doc
debugOut(" import XML: "
      + createImporterXML(piStr, dominoForm, replID, UNID));
stream.write(createImporterXML(piStr, dominoForm, replID, UNID)
      .getBytes());
debugOut(" Stream filled");
importer = s.createDxlImporter();
//this will allow us to insert new documents, ib replica/UNID
// does not match
importer.setReplicaRequiredForReplaceOrUpdate(false);
importer
.setDocumentImportOption(DxlImporter.DXLIMPORTOPTION_UPDATE_ELSE_CREATE);
debugOut(" DXLImporter created");
//process import / update
importer.importDxl(stream, db);
debugOut(" document imported/updated");
stream.close();

if (isNew) {
   //New doc -> find the new document and attach the xfdl file
   String id = importer.getFirstImportedNoteID();
   debugOut(" first node requested: " + id);

   boolean found = false;
   docAtt = db.getDocumentByID(id);
   //may be we created multiple items
   //this can occure, if the extracted data instance was not OK
   while ((docAtt != null) && (found == false)) {
      if (docAtt.getItemValueString("Form").equals(dominoForm)) {
         found = true;
      } else {
         debugOut(" wrong form: "
               + docAtt.getItemValueString("Form"));
         id = importer.getNextImportedNoteID(id);
         debugOut(" next node requested: " + id);
         docAtt = null;
```

```
                        docAtt = db.getDocumentByID(id);
                     }
                  }
               }
               if (docAtt != null) {
                  //Now attach the xfdl file, if we found a new doc
                  debugOut(" node accessed: " + docAtt.getUniversalID());
                  createAttachment(docAtt, fileName, targetField, s,
                        theStream, contentType);
                  //store the formID to the document to find it for future updates
                  docAtt.replaceItemValue("XFDLID", formID);
                  //docAtt.computeWithForm(true, true);
                  if (docAtt.save(true)) {
                     //out.println("<br>New Document Saved");
                     //out.println("<br>Thanks for submitting this eform!");
                     out.println(getRespMessage(nextUrl) );
                     //doc.recycle();
                  } else {
                     debugOut(" node not found.");
                     out.println("<br>Unable to save document<br><br>");
                     if (!nextUrl.equals("")) out.println("<a href=\"" + nextUrl+"\">Return
to application home page</a>");
                     out.println("</body></html>");
                  }

               }else {
                  //out.println("<br>Updated Document Saved");
                  //out.println("<br>Thanks for submitting this eform!");
                  out.println(getRespMessage(nextUrl) );
               }

               //docAtt.recycle();
               vw.recycle();
               db.recycle();
               s.recycle();

            }

            catch (Exception e) {
               System.out.println(e.getMessage());
               out.println("<br>Runtime Error<br><br>");
               out.println(e.getMessage()+"<br><br>");
               if (!nextUrl.equals("")) out.println("<a href=\"" + nextUrl+"\">Return to
application home page</a>");
               out.println("</body></html>");
            }

         }

         catch (Exception ex) {
            System.out.println(ex.getMessage());
            ex.printStackTrace();
            out.println("<br>Runtime Error<br><br>");
            out.println(ex.getMessage()+"<br><br>");
            if (!nextUrl.equals("")) out.println("<a href=\"" + nextUrl+"\">Return to
application home page</a>");
            out.println("</body></html>");
         } finally {
            NotesThread.stermThread();
         }
```

```
    } // end of method Post

    //support methods
    //read xdfl form from PormNodeP as String
    private static String getFormAsString(FormNodeP theForm)
    throws UWIException, IOException {
       ByteArrayOutputStream baos = new ByteArrayOutputStream();
       theForm.writeForm(baos, null, 0);
       baos.flush();
       return baos.toString();

    }

    //search and replace Strings
    private static String replaceSubString(String inputString,
          String searchString, String replaceString) {

       int i = inputString.indexOf(searchString);
       if (i == -1) {
          return inputString;
       }

       String r = "";
       r += inputString.substring(0, i) + replaceString;
       if (i + searchString.length() < inputString.length()) {
          r += replaceSubString(inputString.substring(i
                + searchString.length()), searchString, replaceString);
       }

       return r;
    }

    //creade an xml instance accepted for DXLImporter for insert and update
    private static String createImporterXML(String piStr, String form,
          String replID, String UNID) {
       //this is a quick and dirty code to transform a xfdl data instance
       //into an DXLImporter compatible xml fragment to insert/updat one dokument
       //string fragments not needed will set in comments.
       /*
        we get this (piStr):
        <FormOrderData xmlns="" xmlns:cm="http://www.PureEdge.com/idk/ibmcm/1.0"
xmlns:custom="http://www.PureEdge.com/XFDL/Custom"
xmlns:designer="http://www.PureEdge.com/Designer/6.1"
xmlns:pecs="http://www.PureEdge.com/PECustomerService"
xmlns:xfdl="http://www.PureEdge.com/XFDL/6.5" xmlns:xforms="http://www.w3.org/2003/xforms">
        <ID>100032</ID>
        <CustomerID></CustomerID>
        <Amount>2184.00</Amount>
        <Discount>0</Discount>
        </FormOrderData>

        we will return thomething like this:

        <database version="7.0">
        <document form='QuotationRequest' version='7.0' replicaid='C125712B00718095'>
        <noteinfo noteid='' unid='AFE0838101C7DB16C125713E00205F6F' sequence='' />
        <!--   -->
        <item name="ID"><text>100032</text></item><!--ID"><text>   -->
        <item name="CustomerID"><text></text></item><!--CustomerID"><text>   -->
```

```
         <item name="Amount"><text>2184.00</text></item><!--Amount"><text>   -->
         <item name="Discount"><text>0</text></item><!--Discount"><text>   -->
         </document>
         </database>

         A better method for this would be an XSLT transformation
         */

        //<database> tag
        String s1 = "<database version=\"7.0\">";
        //<document> tag - mandatory use ' - not " as string quotes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
        //assign the correct db replica id for document update!
        s1 = s1 + "<document form='" + form + "' version='7.0' replicaid='"
        + replID + "'>";
        //<noteInfo> tag - mandatory use ' - not " as string quotes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
        //assign the correctdocument UNID id for document update!
        s1 = s1 + "<noteinfo noteid='' unid='" + UNID + "' sequence='' />";
        //comment tag - necessary because in item elements we will begin with "-->"
        s1 = s1 + "<!--";
        //preconfigure end tags
        String s2 = "--></document></database>";
        String instanceXML = piStr;

        //first - stripe data instance tag / end tag
        instanceXML = instanceXML.substring(instanceXML.indexOf(">") + 1,
              instanceXML.length());
        instanceXML = instanceXML.substring(0, instanceXML.lastIndexOf("</"));

        //replace all element end tag brackets </  wih "#endtag1#"
        instanceXML = replaceSubString(instanceXML, "</", "#endtag1#");
        //replace all element brackets >  wih "#endtag1#"
        instanceXML = replaceSubString(instanceXML, ">", "#endtag2#");
        //replace all begin brackets < with "--><item name=\""
        instanceXML = replaceSubString(instanceXML, "<", "--><item name=\"");
        //replace all former brackets > with "\"><text>"
        instanceXML = replaceSubString(instanceXML, "#endtag2#", "\"><text>");
        //replace all former end tags </ with "</text></item><!--"
        instanceXML = replaceSubString(instanceXML, "#endtag1#",
        "</text></item><!--");

        //now ad begin and end tags for database / document
        instanceXML = s1 + instanceXML + s2;
        return instanceXML;
     }

     //read an input stream to a String
     private static String getString(PipedInputStream pi) {
        String piStr = "";
        //this will work only for short sring (< 2048 bytes)
        //longer Strings must be read in a loop
        try {
           int rest = 0;
           byte[] b = new byte[2048];
           rest = pi.read(b, 0, 2048);
           piStr = new String(b);
        } catch (java.io.IOException e) {
           e.printStackTrace();
        }
```

```
   return piStr;
}



//create an attachment in a notes document as mime type
private static void createAttachment(Document docAtt, String fileName,
      String targetField, Session session, ServletInputStream servletin,
      String contentType) throws IOException{
   try {
      servletin.reset(); //make sure, we read full post
      //Create mime entity
      // Do not convert MIME to rich text
      session.setConvertMIME(false);
      boolean isNew = true;
      Stream stream = session.createStream();
      MIMEEntity body = null;
      MIMEHeader header = null;

      // Create parent entity if new doc
      if (!(docAtt.hasItem(targetField))) {
         body = docAtt.createMIMEEntity(targetField);
         header = body.createHeader("Content-Type");
         header.setHeaderVal("multipart/mixed");
      } else {
         try {
            body = docAtt.getMIMEEntity(targetField);
            header = body.getNthHeader("Content-Type", 1);
            isNew = false;
         } catch (Exception em){
            // seams not a mime type item -> delete the field and create a mimetype
            docAtt.removeItem(targetField);
            body = docAtt.createMIMEEntity(targetField);
            header = body.createHeader("Content-Type");
            header.setHeaderVal("multipart/mixed");
         }
      }

      //transfer xfdl document into a buffer document
      int readCounter = 1;
      byte[] b = new byte[2048];
      byte[] bEnd;
      int numberOfBytesRead = 0;
      while ((numberOfBytesRead = servletin.read(b, 0, b.length)) != -1) {
         if (numberOfBytesRead != 2048) {//last part of the message -
            // truncate the buffe after end
            // of request
            byte[] bTrunc = new byte[numberOfBytesRead];
            for (int i = 0; i < numberOfBytesRead; i++)
               bTrunc[i] = b[i];
            stream.write(bTrunc);
         } else
            stream.write(b);
         readCounter++;
      }
      // we will close the stream later on, when all data is processed
      servletin.reset();

      //prepare stream to write into mime entity
      stream.setPosition(0); //set pointer at the first character/byte
```

```
            body.setContentFromBytes(stream, contentType, MIMEEntity.ENC_NONE);
            body.decodeContent();

            //now care about file name and other header values
            String currFileName = fileName;

            //create file name
            if (currFileName.indexOf("#ID#") > -1) {
               java.text.SimpleDateFormat formatter = new java.text.SimpleDateFormat(
               "yyyy-MM-dd-HH-mm-ss-SSS");
               java.util.Date currentTime = new java.util.Date();
               String dateString = formatter.format(currentTime);
               currFileName = currFileName.substring(0, currFileName
                     .indexOf("#ID#"))
                     + dateString
                     + currFileName.substring(
                           currFileName.indexOf("#ID#") + 4, currFileName
                           .length());
               dateString = "";
            }

            //write headers
            if (isNew) {
               //new -> create headers and set
               header = body.createHeader("Content-Disposition");
               header.setHeaderVal("attachment; filename=" + currFileName);
               header = body.createHeader("Content-ID");
               header.setHeaderVal(currFileName);
            } else {
               //update -> get headers and set new file name
               header = body.getNthHeader("Content-Disposition", 1);
               header.setHeaderVal("attachment; filename=" + currFileName);
               header = body.getNthHeader("Content-ID");
               header.setHeaderVal(currFileName);
            }

            //close the request and save request document
            docAtt.closeMIMEEntities(true, targetField);
            stream.close();
            docAtt.save(true, true);
            debugOut("attachment created: " + currFileName);

            //now clean up request objects and call the agent with the request
            // doc as context
            body.recycle();
            session.setConvertMIME(true);
         } catch (lotus.domino.NotesException en) {
            en.printStackTrace();
         } catch (java.io.IOException ei) {
            ei.printStackTrace();
         }
      }

      //write a trace lne, if debug mode in on
      static void debugOut(String str) {
         if (debugMode.equals("on")) {
            System.out.println(sv + ": " + str);
         }
      }
```

```
    //compose a response message, if there are no errors.
    //if the call had an url= parameter, redirect to this url
    static String getRespMessage(String nextUrl) {
       String respMessage = "";
       if (nextUrl.equals(""))
       {
          respMessage = "<html><h2>Document processed</h2><B></html>";
       }
       else
       {
          respMessage = "<html><head>";
          respMessage = respMessage + "<script language=\"JavaScript\">";
          respMessage = respMessage +"open(\"" + nextUrl+"\",\"\");";
          respMessage = respMessage + "self.focus();self.close();";
          respMessage = respMessage + "</script>";
          respMessage = respMessage + "</head><body></body></html>";

          respMessage = "<html><head></head><body>";
          respMessage = respMessage + "<form name=\"f\" action=\"" + nextUrl + "\"
method=get></form>";
          respMessage = respMessage +"<script language=\"JavaScript\">function
s(){document.f.submit();}window.setTimeout(\"s()\",10);</script>";
          respMessage = respMessage + "<a href=\"javascript:subm()\">please click here if
forwarding does not work in your browser</a>";
          respMessage = respMessage + "</body></html>";
       }
       return respMessage;
    }
    static String extracXFormstInstance(FormNodeP theForm, String strPath, String element){
       String ret = "";
          StringWriter sw = new StringWriter();
          debugOut ("try extraxt XForms instance: " + strPath +"");
          try{ theForm.extractXFormsInstance(null, strPath ,false, true, null, sw);
          ret = sw.toString();
          debugOut("Element found: " + ret);
          ret = getElement(ret, element);
          } catch (UWIException euwi) {debugOut("Element not found: " + strPath);}
       return ret;
       }
static String getElement(String xmlin, String elementName){
    String xml = xmlin;
    xml = xml.substring(1,xml.indexOf("</"+elementName+">"));
    xml = xml.substring(xml.lastIndexOf(">")+1, xml.length());
    return xml;
    }


} // end of class
```

The servlet version above must run on a Domino server, since it does not connect remotely to the server.

For connecting remotely to a Domino server, such as using WebSphere Application Server (WAS) as a servlet engine, the Domino session can be initiated as Example 9-21.

Example 9-21 Initiating the Domino session

```
   //open Domino session
   //ORBServer is the name of a Domino Server running DIIOP task
   //if ORBServer is empty we assume we are running on a Domino sever
   //dbServer is the server name, whete the target db is located
   //if have additional settings in servlet.properties file for
   //ORBServer, dbServer, userName and password

    try {
   NotesThread.sinitThread();
      //very importand - without this all concurrent running sessions will mix up
      //their domino objects ....
    if (ORBServer.equals("")  || ORBServer.equals("localhost"))
      { //local session without DIIOP
      errorMessageDetail =
      "Error creating local Domino session (may be username or password in” +
         “servlets.properties not valid)";
      session = NotesFactory.createSession("",userName, password); }
      else
      { //remote session using DIIOP
         errorMessageDetail =
         "Error creating remote Domino session over DIIOP. ORBServer: '" + ORBServer +
         "' (may be ORBServer, username or password in servlets.properties not valid)";
         session = NotesFactory.createSession(ORBServer,userName, password);
      }

   if (debugMode.equals("on"))  {System.out.println("SID: " + String.valueOf(sessionCallId)
      + " " + "2. Domino session created - read request message");}

   if (dbServer.equals("") || dbServer.equals("localhost"))
         {//get the target databas
         errorMessageDetail = "target database on localhost not found (insuffitient rights
or dbPath in servlets.properties not valid)";
         db = session.getDatabase(null, dbPath);}
     else
        {
         errorMessageDetail = "target database on server '" + dbServer +
         "' not opened (insuffitient rights or dbPath in servlets.properties not valid)";
         db = session.getDatabase(dbServer, dbPath);}

.....
   } catch ( lotus.domino.NotesException en){
      en.printStackTrace();
      errorMessageText ="ERROR: " + en.id + "ErrorMessage: " + en.text;
   }
   finally {
      NotesThread.stermThread();
   }
```

Servlet deployment

To deploy the servlet (see Example 9-22), we have to complete three tasks:

1. Compile the servlet into a ProcessXFDL.class file.
2. Copy the class file to the <DominoDataRoot>/Domino/Servlets directory.
3. Copy the following servlets.properties file, as shown in Example 9-22, to the <DominoDataRoot> directory.

Example 9-22 The servlet.properties file in Domino server data root

```
############## beginning of servlets.properties #####################
#assign an alias for each different servlet behavior:
servlet.XFDLServlet.code=ProcessXFDL

############## begin Domino Integration servlet parameters#####################

#set a behavior for the servlet using the following parameters
#  specify the following parameters
#  paramexampledescription
#  targetFieldname of the target field to create the request file attachment.
#                 This attachment contains the complete POST request data
#     body  Create the attachment in Body field
#     <empty>if no value is assigned, the field name is "body"
#
#  fileNamespecify any valid file name for the created attachment
#                 place #ID# in the name where a unique ID should be added.
#     request.txt
#     incomingPO#ID#.xfdl
#
#  contentTypecontent type for the stored attachment.
#           Specify and valid content type for mime types
#     text/plainPlain text
#     text/xmlxml
#     text/htmlhtml page
#     application/xmlxml document
#
#  debugModewill cause the servlet to print debug messages in system console if set to 'on'
#     on    print trace messages
#     off   do not print trace messages
#
#  usernameUsername of a technical user, who can update all relevant documents during value
extraction process
#
#  passwordhttp password for this user


# process an incoming xfdl (Workplace Forms) document calling a post processing agent
(processPO)
#anonymous access to the database (no username/password)
#generate a standard html return message or open a specified url if url= parameter is set
in the post action (no response field declared)
 servlet.XFDLServlet.initArgs ORBServer=localhost,\
            userName=,\
            password=,\
            targetField=Body,\
            fileName=PO#ID#.xfdl,\
            contentType=application/xfdl,\
            deleteReqDocs=0,\
            debugMode=on,\
            respMessageType=html
```

```
############## end of servlets.properties ######################
```

After making changes to the *servlet.properties* file or the deployed *RenderXFDL.class* file, the Domino HTTP task must be restarted. On the server console, enter:

```
tell HTTP restart
```

Now we describe the next component to build — the new QuotationRequest form.

QuotationRequest form and corresponding views

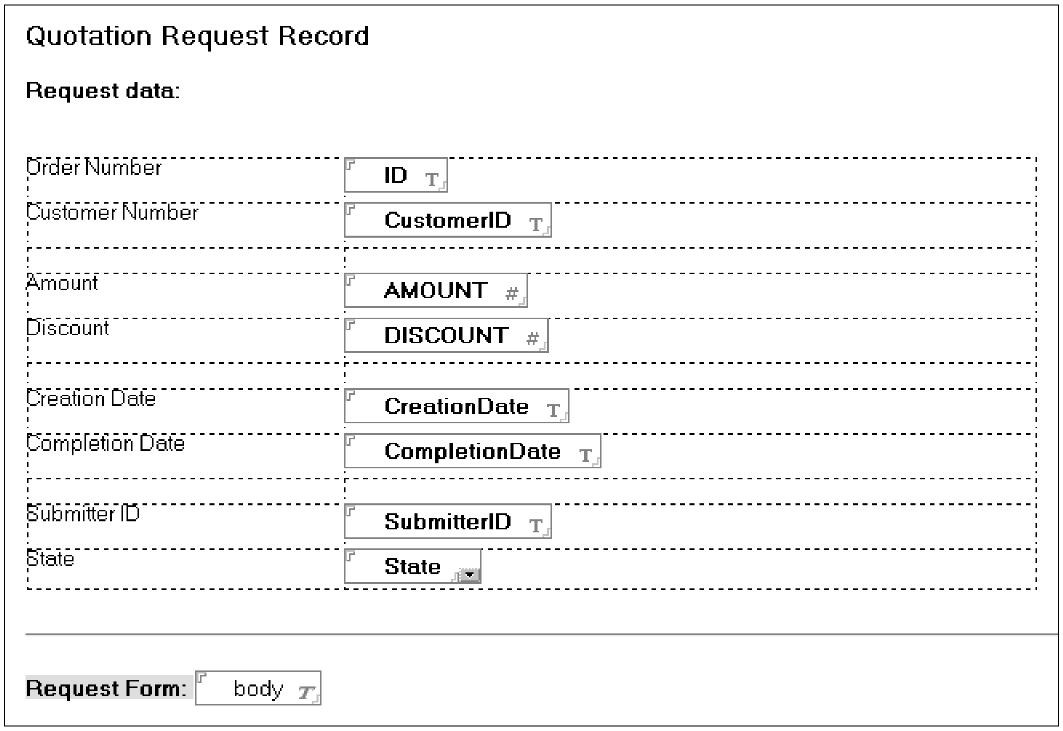
This form should contain a body field to store the submitted XFDL form (named Body, as defined in the servlet.properties file) and some fields containing the detail data extracted from the XFDL form. The field names must match exactly the element names in the extracted data instance (Example 9-23).

Example 9-23 Data instance FormOrderData to extract into the request document

```
                <xforms:instance id="FormOrderData" xmlns="">
                  <FormOrderData>
                     <ID></ID>
                     <CustomerID></CustomerID>
                     <Amount></Amount>
                     <Discount></Discount>
                     <SubmitterID></SubmitterID>
                     <State>1</State>
                     <CreationDate></CreationDate>
                     <CompletionDate></CompletionDate>
                     <Owner></Owner>
                     <Version>0</Version>
                     <Approver1></Approver1>
                     <AppovalDate1></AppovalDate1>
                     <Approver1Comment></Approver1Comment>
                     <Approver2></Approver2>
                     <AppovalDate2></AppovalDate2>
                     <Approver2Comment></Approver2Comment>
                       <Cost></Cost>
                  </FormOrderData>
               </xforms:instance>a>
```

DXLImporter creates all these fields in the request document. Nevertheless, we only design some of them in the form.

Create a form in the template DB named QuotationRequest (as defined in the servlets.properties file) and create the necessary fields. The form should look as shown in Figure 9-38.



Quotation Request Record

Request data:

Order Number	ID
Customer Number	CustomerID
Amount	AMOUNT
Discount	DISCOUNT
Creation Date	CreationDate
Completion Date	CompletionDate
Submitter ID	SubmitterID
State	State

Request Form: body

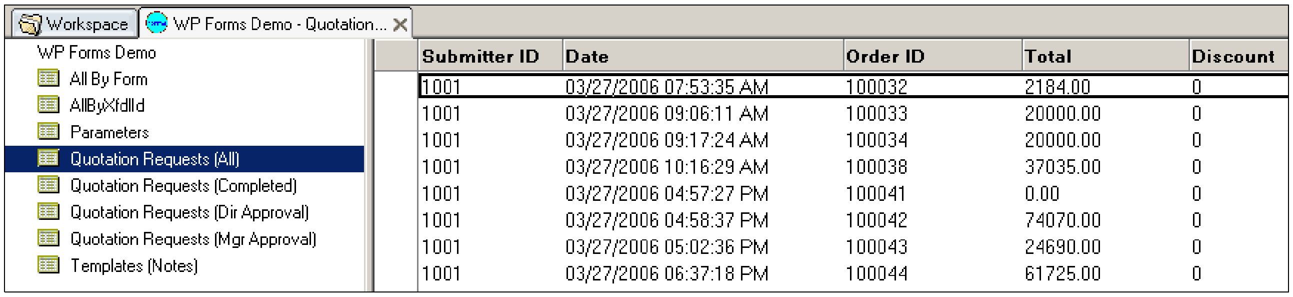
Figure 9-38 Form QuotationRequest

To prevent caching in the browser, insert the following code in the form's HTML header content (Example 9-24). Save the form.

Example 9-24 HTML header code preventing IE6 from caching old content

```
"<META HTTP-EQUIV=\"Pragma\" CONTENT=\"no-cache\">"+
"<META HTTP-EQUIV=\"Expires\" CONTENT=\"-1\">"
```

Create a maintenance view, `Quotation Requests (All)`, for the forms, as shown in Figure 9-39.



Workspace
WP Forms Demo - Quotation...
WP Forms Demo
All By Form
AllByXfdlId
Parameters
Quotation Requests (All)
Quotation Requests (Completed)
Quotation Requests (Dir Approval)
Quotation Requests (Mgr Approval)
Templates (Notes)

Submitter ID	Date	Order ID	Total	Discount
1001	03/27/2006 07:53:35 AM	100032	2184.00	0
1001	03/27/2006 09:06:11 AM	100033	20000.00	0
1001	03/27/2006 09:17:24 AM	100034	20000.00	0
1001	03/27/2006 10:16:29 AM	100038	37035.00	0
1001	03/27/2006 04:57:27 PM	100041	0.00	0
1001	03/27/2006 04:58:37 PM	100042	74070.00	0
1001	03/27/2006 05:02:36 PM	100043	24690.00	0
1001	03/27/2006 06:37:18 PM	100044	61725.00	0

Figure 9-39 Maintenance view for all request documents

There are no special requirements for this view. Make one column appear as a link in the browser.

Assign the selection formula:

```
SELECT Form="QuotationRequest"
```

Save the view. Next make three copies of the view and change view title and selection formula as follows (Table 9-8).

Table 9-8 Additional quotation requests corresponding to workflow state

View title	Selection formula
Quotation requests (completed)	SELECT Form="QuotationRequest" & State = "4"
Quotation requests (manager's approval)	SELECT Form="QuotationRequest" & State = "2"
Quotation requests (director's approval)	SELECT Form="QuotationRequest" & State = "3"

Next we create a lookup view to find the request documents related to the incoming XFDL form.

Form lookup view

To create a form-independent relationship between an incoming XFDL form and related documents in a Notes database, we need corresponding unique keys in both the Notes document and the XFDL form.

It is a good idea to create in each form template a data item containing a unique identifier. This value can be set, for example, when creating new documents from a template. In our scenario, we have a unique order number. We use this order number as this identifier. We can use any other unique identifier as well. Make sure that all incoming XFDL forms to the servlet have the same ID only, when they are related to the same business object.

The lookup view to create is simple. Use the following parameters to create the view:

- View Name: `AllByXfdlId` (This name is hard coded in the servlet.)
- Selection Formula: `SELECT @Trim(XFDLID) != ""`
- First Column: `Field XFDLID, sorted case insensitive`
- Second Column: Formula `@Text(@DocumentUniqueID)`

Compare the related XForms instance element used in the XFDL form. This element is bound to the order number items and receives the value when the order number is applied (Example 9-25).

Example 9-25 Element <FormID> in the ConfigurationInfo instance

```
<!-- Form Configuration Parameters -->
      <xforms:instance id="ConfigurationInfo" xmlns="">
         <ConfigurationInfo>
            <XFDLSubmissionURL>http://vmforms261.......</XFDLSubmissionURL>
            <XFormsSubmissionURL>http://vmforms.........</XFormsSubmissionURL>
            <FormID>DBD81B45138A8CC2C125724000101DEF</FormID>
            <DbPath>forms\wpforms.nsf</DbPath>
            <DominoForm>QuotationRequest</DominoForm>
            <InstanceID>FormOrderData</InstanceID>
         </ConfigurationInfo>
      </xforms:instance>-->
```

Attention: To utilize the demo application and the created submission servlet with non-XForms XFDL form as well, we look for an XFDL element at the path global.global.custom:formid if we recognize that the processed form is not XForms enabled.

Having the form and views in place and the servlet/servlets.properties file deployed on the server, restart the HTTP task and see how it works.

Submitting the XFDL form in the Domino environment

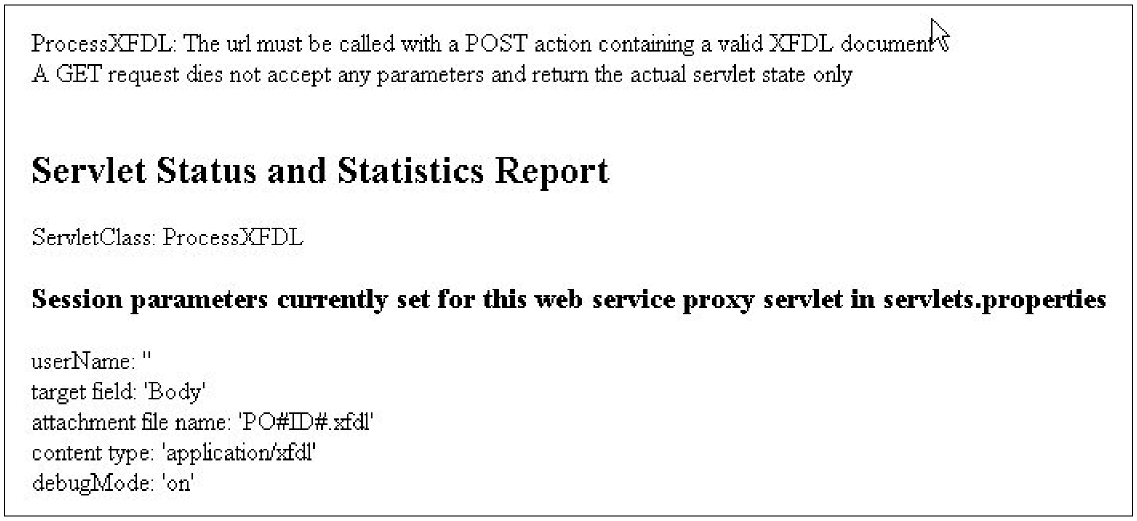
Perform the following tests.

First test

Hit the servlet. From your browser, enter:

```
http://vmforms261.cam.itso.ibm.com/servlet/XFDLServlet
```

The following panel should appear (Figure 9-40).



```
ProcessXFDL: The url must be called with a POST action containing a valid XFDL document
A GET request dies not accept any parameters and return the actual servlet state only

Servlet Status and Statistics Report

ServletClass: ProcessXFDL

Session parameters currently set for this web service proxy servlet in servlets.properties

userName: ''
target field: 'Body'
attachment file name: 'PO#ID#.xfdl'
content type: 'application/xfdl'
debugMode: 'on'
```

Figure 9-40 Servlet test with a GET request displays available settings

Next test

Create a new quotation request, enter data, and submit it.

These are the check points to look for:

- The order number must be set, and employee data must be filled (prepopulation running).
- When clicking customer choices or item selection there must be choices available (XForms submissions running, target URLs for the submissions successfully changed by text parsing).
- When selecting a customer and an item detail, data must appear (detail data XForms submissions running and matching created data instances)
- Sign the document and remember the order number (make a note of it for reference).

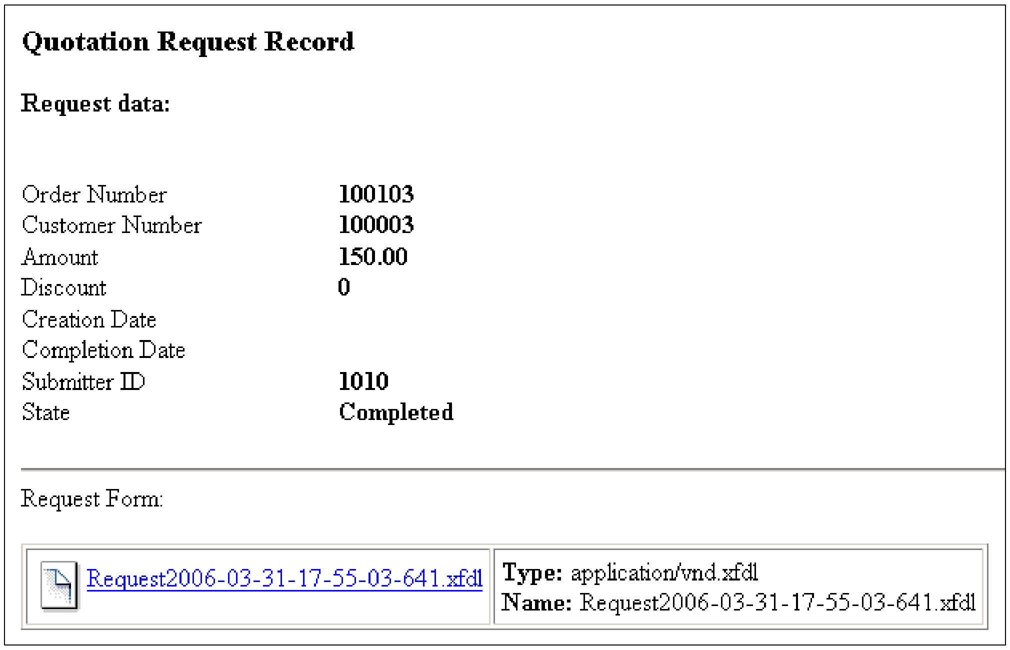
- Submit it. The Domino log should show a lot of trace lines related to the form submission (Example 9-26).

Example 9-26 Trace lines in Domino log on XFDL form submit

```
03/31/2006 05:55:00 PM  HTTP JVM: ProcessXFDL:  next url:
'http://vmforms261.cam.itso.ibm.com/forms/WPForms.nsf'
03/31/2006 05:55:02 PM  HTTP JVM: ProcessXFDL:  theForm created
03/31/2006 05:55:02 PM  HTTP JVM: ProcessXFDL:  form stored to formString
03/31/2006 05:55:02 PM  HTTP JVM: ProcessXFDL:  Form ID: 100103
03/31/2006 05:55:02 PM  HTTP JVM: ProcessXFDL:  data instance extracted
03/31/2006 05:55:02 PM  HTTP JVM: ProcessXFDL:  stream: <FormOrderData xmlns=""
xmlns:cm="http://www.PureEdge.com/idk/ibmcm/1.0"
xmlns:custom="http://www.PureEdge.com/XFDL/Custom"
xmlns:designer="http://www.PureEdge.com/Designer/6.1"
xmlns:pecs="http://www.PureEdge.com/PECustomerService"
xmlns:xfdl="http://www.PureEdge.com/XFDL/6.5" xmlns:xforms="http://www.w3.org/2003/xforms">
   <ID>100103</ID>
   <CustomerID>100003</CustomerID>
   <Amount>150.00</Amount>
   <Discount>0</Discount>
   <SubmitterID>1010</S
03/31/2006 05:55:03 PM  HTTP JVM: ProcessXFDL:  form destroyed
03/31/2006 05:55:03 PM  HTTP JVM: ProcessXFDL:  Notes session created
03/31/2006 05:55:03 PM  HTTP JVM: ProcessXFDL:  Notes db found
03/31/2006 05:55:03 PM  HTTP JVM: ProcessXFDL:  import XML: <database
version="7.0"><document form='QuotationRequest' version='7.0'
replicaid='8825714100620266'><noteinfo noteid='' unid='' sequence='' /><!--
   --><item name="ID"><text>100103</text></item><!--ID"><text>
   --><item name="CustomerID"><text>100003</text></item><!--CustomerID"><text>
   --><item name="Amount"><text>150.00</text></item><!--Amount"><text>
   --><item name="Discount"><text>0</text></item><!--Discount"><text>
   --><item name="Su
03/31/2006 05:55:03 PM  HTTP JVM: ProcessXFDL:  Stream filled
03/31/2006 05:55:03 PM  HTTP JVM: ProcessXFDL:  DXLImporter created
03/31/2006 05:55:03 PM  HTTP JVM: ProcessXFDL:  document imported/updated
03/31/2006 05:55:03 PM  HTTP JVM: ProcessXFDL:  first node requested: 99A
03/31/2006 05:55:03 PM  HTTP JVM: ProcessXFDL:  node accessed:
45EA41465C22294588257143000A88A4
03/31/2006 05:55:03 PM  HTTP JVM: ProcessXFDL: attachment created:
Request2006-03-31-17-55-03-641.xfdl
```

- The available views should be displayed as response pages.
- Navigate to the Quotation Requests (All) view.

- Find the document with the order number, and open it (Figure 9-41).



Quotation Request Record

Request data:

Order Number	**100103**
Customer Number	**100003**
Amount	**150.00**
Discount	**0**
Creation Date	
Completion Date	
Submitter ID	**1010**
State	**Completed**

Request Form:

Request2006-03-31-17-55-03-641.xfdl	**Type:** application/vnd.xfdl **Name:** Request2006-03-31-17-55-03-641.xfdl

Figure 9-41 New created request document

9.7 Scenario 2 - integrating Forms Viewer with Notes Client - overview and objective

Integrating Workplace Forms with the Notes client by using the Forms Viewer is covered in scenario 2. In Appendix D, “Additional material” on page 693, we have a Notes database that contains several integration techniques for Workplace Forms documents with the Notes client. There can be many reasons to integrate Forms and Domino using the Notes Client in contrast to the browser scenario that we do in scenario 1:

- Notes client integration makes it possible to use Forms in any offline scenario with distributed databases and data replication. This utilizes the strengths of both products in a best manner for customers using Notes client-based applications.
- The base application may not be Web enabled at all. Web enabling complex Notes applications just for Forms integration is, in most cases, not the way to go because of development costs, the completely changed end-user experience, and the high risk of necessary application migrations.
- In environments where we use Forms in a Domino-based application without having the Viewer installed on the end-user desktops, Notes client integration makes it possible to work with Forms by using the Webform Server. This use case is the subject of the third scenario.

Attention: For the Notes client integration, we simply add an agent, a script library, a button, and code to a script event of the form, which can be done by inserting a generic subform. This way, we can Forms-enable nearly every Notes application without taking high risks, and minimizing the work effort involved.

For now, we discuss the Notes client/Forms Viewer integration on the desktop. There are different aspects of the Notes client integration with the Forms Viewer that we explore:

- Various initiation techniques (on document open, or using a Notes button)
- Different technologies used to prepopulate/extract data (using LotusScript, using Forms Java API with a Java agent or LS2J or in a servlet, and so on)
- Different Notes client behavior (locked or released Notes client during work in the Forms Viewer)

There are also various permutations of scenarios for this type of integration. In this book we focus on the following scenarios:

- Use case 2.1 - Notes client locked during Forms handling, working from a local replica or server based of the Notes database using LotusScript for prepopulation via data extraction
- Use case 2.2 - Notes client released during Forms handling, working from a local or server based replica of the Notes database using LotusScript for prepopulation via data extraction
- Use case 2.3 - Notes client locking or released during Forms handling, working from a local or server based replica of the Notes database using Java API for prepopulation via data extraction

All of these use cases are built on top of the created Forms integration use case for the Web-enabled application in the previous chapter (scenario 1). We use the same template and QuotationRequest form to store XFDL files and the corresponding metadata. Even the created Forms integration framework (four Instances to prepopulate, one instance to extract data) are unchanged.

For the end user (who in some cases will probably be the Forms developer), we see in these use cases one significant difference. Since we are potentially operating offline, the integration cannot use any submissions to the server. Therefore, we use the file system to submit completed forms.

The form design should relate to this and offer a Save button to the end user rather than a Submit button (pr a button named Submit that processes a save and close). For these scenarios, we close the Viewer. It asks the end user to save the changes in the form the same way as, for example, operation in a text editor.

Important: In the form used for this book, we do not hide or manipulate the Submit button in the form. We do not make use of it in the Notes client. However, we preserve the button in the Designer so that it can be used in use cases that will need submit buttons.

9.8 Scenario 2 - environment overview

Scenario 2 covers all Notes Client related use cases that use the Forms Viewer to work in the form and no server components. This scenario covers use cases where we can go totally offline (assuming that the form does not need any communication to external data sources such as Web services or XForms submission services). See Figure 9-42.

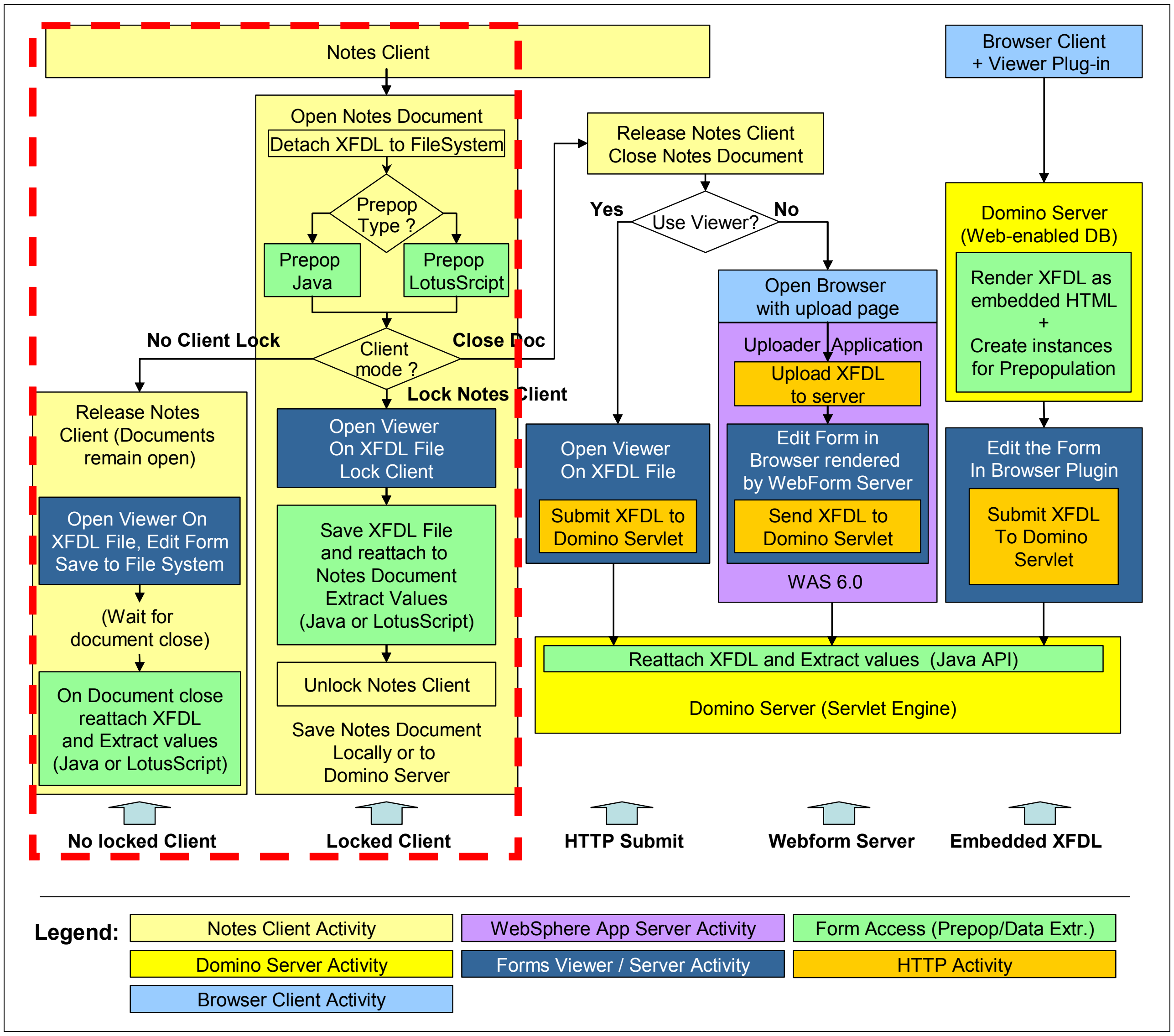

Notes Client
Browser Client + Viewer Plug-in
Open Notes Document
Detach XFDL to FileSystem
Prepop Type ?
Prepop Java
Prepop LotusSrcipt
Release Notes Client Close Notes Document
Yes
Use Viewer?
No
Domino Server (Web-enabled DB)
Render XFDL as embedded HTML + Create instances for Prepopulation
Open Browser with upload page
Uploader Application
Upload XFDL to server
No Client Lock
Client mode ?
Close Doc
Lock Notes Client
Release Notes Client (Documents remain open)
Open Viewer On XFDL File Lock Client
Open Viewer On XFDL File
Submit XFDL to Domino Servlet
Edit Form in Browser rendered by WebForm Server
Send XFDL to Domino Servlet
WAS 6.0
Edit the Form In Browser Plugin
Submit XFDL To Domino Servlet
Open Viewer On XFDL File, Edit Form Save to File System
Save XFDL File and reattach to Notes Document Extract Values (Java or LotusScript)
(Wait for document close)
Unlock Notes Client
Reattach XFDL and Extract values (Java API)
Domino Server (Servlet Engine)
On Document close reattach XFDL and Extract values (Java or LotusScript)
Save Notes Document Locally or to Domino Server
No locked Client
Locked Client
HTTP Submit
Webform Server
Embedded XFDL
Legend:
Notes Client Activity
WebSphere App Server Activity
Form Access (Prepop/Data Extr.)
Domino Server Activity
Forms Viewer / Server Activity
HTTP Activity
Browser Client Activity

Figure 9-42 Domino environment use case overview - building scenario 2 (Notes Client and Forms Viewer integration)

The diagram on Figure 9-42 shows how we explore multiple code streams. They are all based on a common form life cycle, but used in three decision points that lead to different solutions. The decisions to make are:

- How to proceed in the Notes client when a user is editing a form. The different solutions presented below comprise the three use cases:
  - Locked client - The user must finish the work in the Viewer before he can continue work in the Notes client). This use case is designed to work in local Notes Clients as in server-based databases.

  - No locked client - The user can, in parallel, work in the Notes client and in the Forms Viewer. When the user closes the Notes document, the user is asked to finish the work in the form to include the results into the closing document. This use case works offline and online.
  - The document is closed right after opening the form - The user can work on both the Notes client and the Viewer. The form is not updated by the Notes client when the work is finished, but by a servlet on the server processing the HTTP submission. This use case works online only. We discuss this use case in scenario 3.
- What techniques can we use for form prepopulation and value extraction?
  - Use Java API (requires the Forms API instantiation in the Notes client).
  - Use LotusScript (no additional installation in Notes Client, but no support for compressed forms, signature validation, and other advanced API features).

9.8.1 Client prerequisites

The Workplace Forms Viewer must be installed and registered in the Windows registry.

Notes client 6.x or 7.x installed. Workplace Forms Java API installed in Notes client.

9.8.2 Server prerequisites

To make it work in a strictly offline context, make sure that the provided forms do not require network connection, for example, using Web services or submissions to other applications. The XFDL form built for the J2EE Stage 1 chapter (standalone form) fits this prerequisite. Using the XFDL form from the J2EE scenario stage 2 chapter, we can operate locally on the database, but the Domino server serving the XForms submissions must be available.

The databases (template database and repository database) can be stored on the server or the client. The path to the template database must match the paths used in the prepopulation tabs of the sample form (see the @formula for the employee data prepopulation) and the parameter document for the XFormsSubmission URL (stage 2 form only).

Note: The scenario 2 and 3 integration techniques are based on the storage of the form as a file attachment (and not an OLE object) in a rich text field of a Notes document — the same way as for the Web client scenario (scenario 1) that we already explored. This allows for the secure long-term storage of the form (as we will always be able to open/detach an attachment, independent of operating system and version of the Notes client).

9.9 Scenario 2 - setting up the Domino environment

The following sections highlight the necessary steps for setting up the Domino environment.

9.9.1 Client installation

The following steps illustrate what needs to be done to set up a client machine for the various implementations of scenario 2:

1. Install Lotus Notes on the client machine (either Version 6.x or 7.x) or to the Domino server.
2. Install the Workplace Forms Viewer V2.6.1 on the client machine.

3. Install the Workplace Forms API Version 2.6.1 (which is included in the IBM Workplace Forms Server installation package), as recommended in the product documentation, on the client machine.
4. Make the Form API available to the Notes Client.
   - Copy the jar files from the Workplace Forms API to the <NotesProgramDir>\jvm\lib\ext directory, where <NotesProgramDir> is usually c:\notes. This ensures that Notes will find the files. The the jar files that should be copied are:
     - pw_api.jar
     - uiw_api.jar
     - pw_api_native.jar
     - uiw_api_native.jar

     OR
   - Ensure that the notes.ini file contains the following entry (adjust the path to your Forms API installation path):

     ```
     JavaUserClasses=c:\WIN2K\system32\PureEdge\70\java\classes\pe_api.jar;c:\WIN
     2K\system32\PureEdge\70\java\classes\uwi_api.jar;
     ```
5. Copy the Notes database to the data directory of the Notes client or create local replicas.
6. Sign the database with a trusted Notes user ID.
7. To test that the client setup is correct, open the Notes database from the Notes client and check the examples, as shown in later sections.

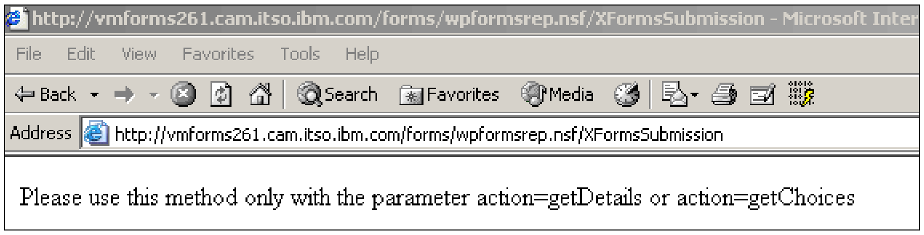
9.9.2 Server installation

The following steps illustrate what needs to be done to set up the server machine for the various implementations of the scenario 2 XFDL form for using the server as an XForms submission service.

1. Install Domino Server Version 6.x or 7.x on the server machine.
2. Activate HTTP and the Domino Servlet Engine on the server machine.
3. Copy the Repository Notes database to the server data directory, forms subdirectory.
4. Open the template database (either on the client or the server) and go to the Parameter view. Adjust the parameters for the XForms submission URL to your environment. (The server name should reflect the name of the current server. All other settings can stay unchanged. Double-check the path to the Notes database.)
5. Ensure that the XForms submission agent in the repository database has sufficient rights to run.
6. Restart the Domino server and make sure that the HTTP and servlet engines are running.
7. To test that the server setup is correct, enter the following URL on a browser on a client machine:

   ```
   http://<yourserver>/forms/wpformsrep.nsf/XFormsSubmission
   ```

The page shown in Figure 9-43 should appear.


http://vmforms261.cam.itso.ibm.com/forms/wpformsrep.nsf/XFormsSubmission - Microsoft Inter
File Edit View Favorites Tools Help
Back Search Favorites Media
Address

http://vmforms261.cam.itso.ibm.com/forms/wpformsrep.nsf/XFormsSubmission

Please use this method only with the parameter action=getDetails or action=getChoices

Figure 9-43 XFormsSubmission agent response to the test URL

9.10 Scenario 2 - Domino development

The following sections are the outlines of the implementation of each scenario that we cover in scenario 2. By implementing the three use cases in this scenario, we cover the following topics:

- Different initiation techniques
- Different technologies used to prepopulate and extract data
- Different client behavior

9.10.1 Scenario 2.1 - local form handling with Viewer and Lotus script, with Notes client locked

All the points in the outline are handled by the code behind the use case 2.1 buttons in the template form and the QuotationRequest form, unless otherwise indicated. We plan to create the following life cycle for the XFDL file stored in the document, when a user opens a document containing an XFDL form as attachment, as shown in Figure 9-44.

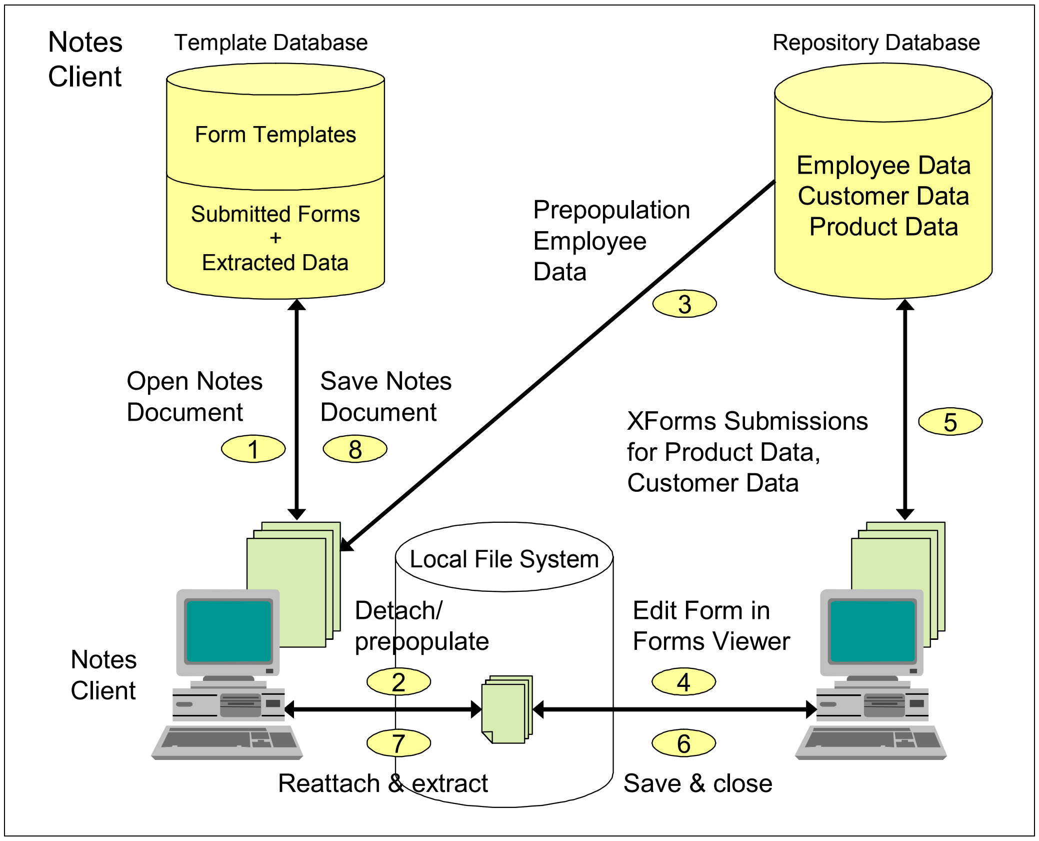


Figure 9-44 Notes document/XFDL form life cycle in Notes Client/Viewer integration

Figure 9-45 on page 580 shows:

1. The user opens the Notes document and clicks the **CreateNewFromTemplate... (Use case 2.1)** or **Edit Attachment - Scenario 2.1** button.
2. The attached XFDL file is detached to a temp directory on the client machine, and the Notes client is locked.
3. The prepopulation of the detached XFDL file is performed using the LotusScript script library.
4. The installation path of the Forms Viewer is detected, and the Viewer is activated and opens the XFDL file in the local file system.
5. The user can now edit the XFDL file in the Viewer. If XForms submissions or Web services are used in the form, the corresponding server is connected. The Notes client is locked all the time, which ensures that the user does not close the related Notes document in the meantime or close down the entire Notes client.
6. Closing the Viewer (*do not* use the Submit button, use the **Save** button in the Viewer icon tray or close the Viewer and when prompted to say, choose Yes), the new version of the XFDL file is saved to file system, and control goes back to the Notes client.

7. Once control is given back to the Notes client, the script running on the client side extracts the data from the saved XDFL file in the file system using the LotusScript code and saves the extracted data to the current Notes document. The saved XFDL is re-attached to the Notes document. Control is passed back to the Notes Client (which unlocks the client in the process).
8. The user can now save the new document to the database.

Attention: For the *New from Template* use case, there is one additional step in the button that creates a new Notes document from the template including the attached empty XFDL template. The additional step is to close the template document and to open the newly created QuotationRequest document. The XFDL is detached from the new document here, not from the template.

Attention: Keep in mind that when composing a new form from the template, the Notes document is stored in one of the QuotationRequest views, as shown in Figure 9-47 on page 581, and not in the template view. To inspect the saved document, navigate to one of these views.

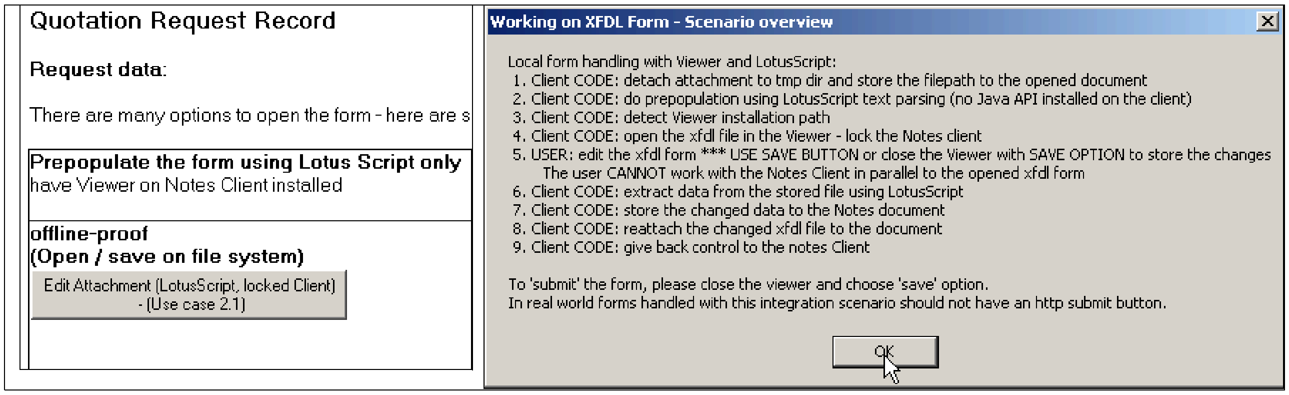
We now go into detail and explore the code behind the attachment handling, prepopulation, and data extraction of the XFDL file for scenario 2.1.

There is a substantial amount of code behind this use case that needs to be created. Please refer to Appendix D, "Additional material" on page 693, to download the Notes database to inspect the code in detail. In this section we highlight the most important code fragments only.

Scenario 2.1 - Initiating button

The initiating button in the template form processes three tasks:

- Displays a message box about the detailed tasks processed in this use case to set focus on what functionality we are actually exploring, as shown in Figure 9-45.
- Creates a new copy of the currently opened document, as shown in Figure 9-46 on page 581.
- Calls the universal XFDL processing routine with the parameters that fit the current use case.


Quotation Request Record

Request data:

There are many options to open the form - here are s

Prepopulate the form using Lotus Script only
have Viewer on Notes Client installed

offline-proof
(Open / save on file system)

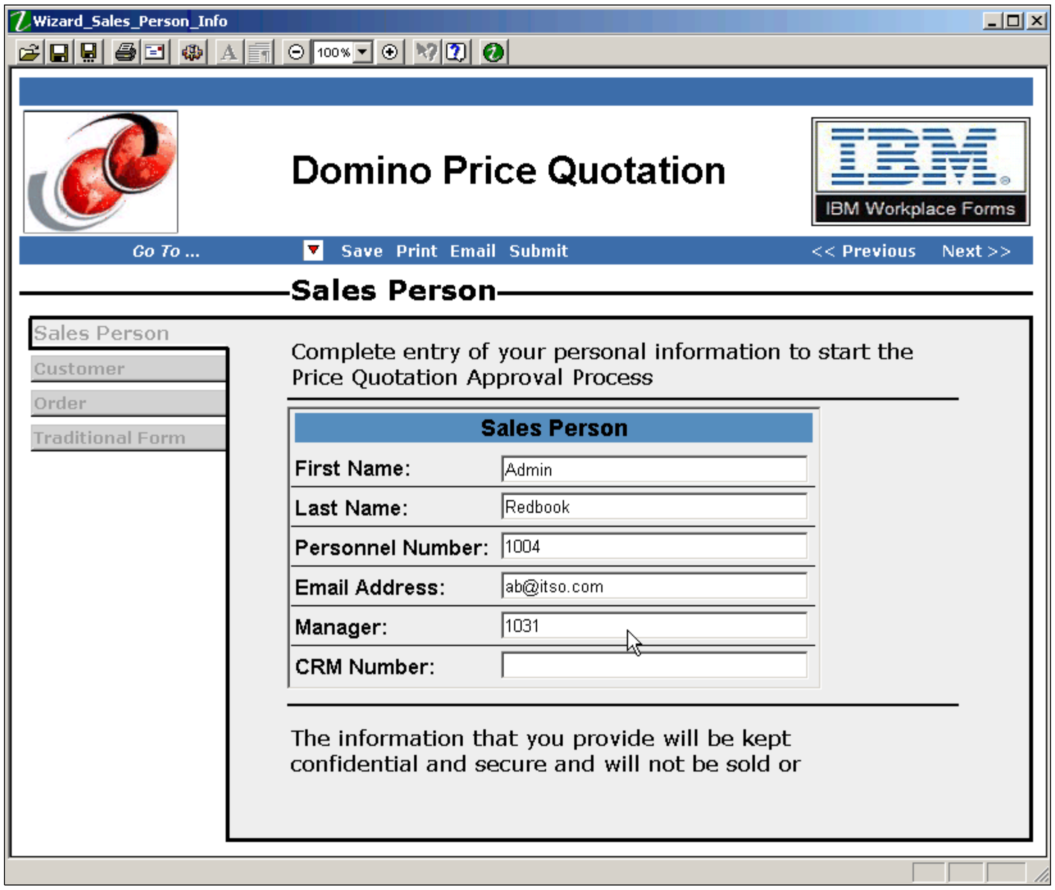
Edit Attachment (LotusScript, locked Client) - (Use case 2.1)

Working on XFDL Form - Scenario overview

Local form handling with Viewer and LotusScript:
1. Client CODE: detach attachment to tmp dir and store the filepath to the opened document
2. Client CODE: do prepopulation using LotusScript text parsing (no Java API installed on the client)
3. Client CODE: detect Viewer installation path
4. Client CODE: open the xfdl file in the Viewer - lock the Notes client
5. USER: edit the xfdl form *** USE SAVE BUTTON or close the Viewer with SAVE OPTION to store the changes
   The user CANNOT work with the Notes Client in parallel to the opened xfdl form
6. Client CODE: extract data from the stored file using LotusScript
7. Client CODE: store the changed data to the Notes document
8. Client CODE: reattach the changed xfdl file to the document
9. Client CODE: give back control to the notes Client

To 'submit' the form, please close the viewer and choose 'save' option.
In real world forms handled with this integration scenario should not have an http submit button.

Figure 9-45 Button NewFromTemplate in scenario 2.1 and the displayed message box



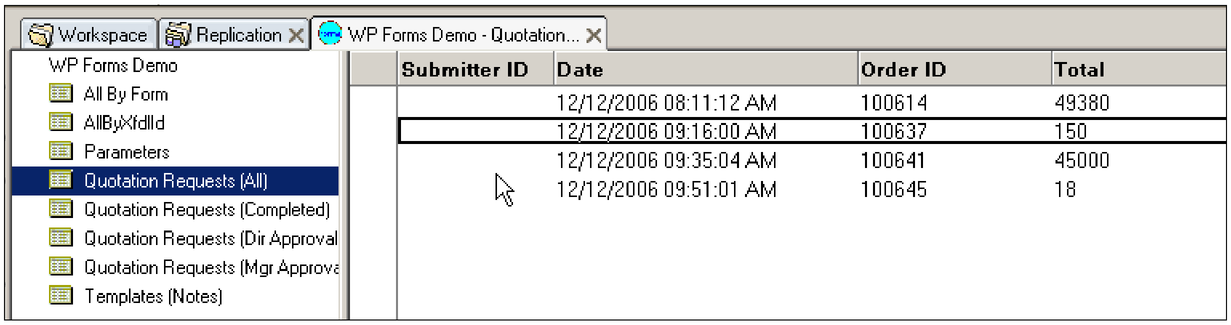
Sales Person

Complete entry of your personal information to start the Price Quotation Approval Process

Sales Person	
First Name:	Admin
Last Name:	Redbook
Personnel Number:	1004
Email Address:	ab@itso.com
Manager:	1031
CRM Number:	

The information that you provide will be kept confidential and secure and will not be sold or

Figure 9-46 The XFDL file stored on local file system opened in the Forms Viewer


Workspace
Replication
WP Forms Demo - Quotation...
WP Forms Demo
All By Form
AllByXfdlId
Parameters
Quotation Requests (All)
Quotation Requests (Completed)
Quotation Requests (Dir Approval
Quotation Requests (Mgr Approva
Templates (Notes)

Submitter ID	Date	Order ID	Total
	12/12/2006 08:11:12 AM	100614	49380
	12/12/2006 09:16:00 AM	100637	150
	12/12/2006 09:35:04 AM	100641	45000
	12/12/2006 09:51:01 AM	100645	18

Figure 9-47 View showing all quotation requests - new requests are added at the bottom

Example 9-27 LotusScript code activated by the NewFromTemplate button

```
Sub Click(Source As Button)


   isFirstOpen = True  'evaluate all prepopulation settings for first open
   prepopType = "LotusScript"
   Dim message As String
   message = "Local form handling .....
..........
   Messagebox message,,"Working on XFDL Form Use case 2.1 - Scenario overview"
   Dim newDoc As NotesDocument
   Set newDoc =  client_NewFromTemplate()

   'client_openXFDLForm(Byval attachmentFieldName As String, prepopType As String, 
documentHandling As String, useServer As Boolean, docIn As NotesDocument)
   Call client_openXFDLForm("Body", prepopType,  "edit", False, newDoc)

End Sub
```

Any called procedures are contained in the script library LibFormsIntegration. Table 9-9 gives the descriptions of the top-level routines called from the user interface.

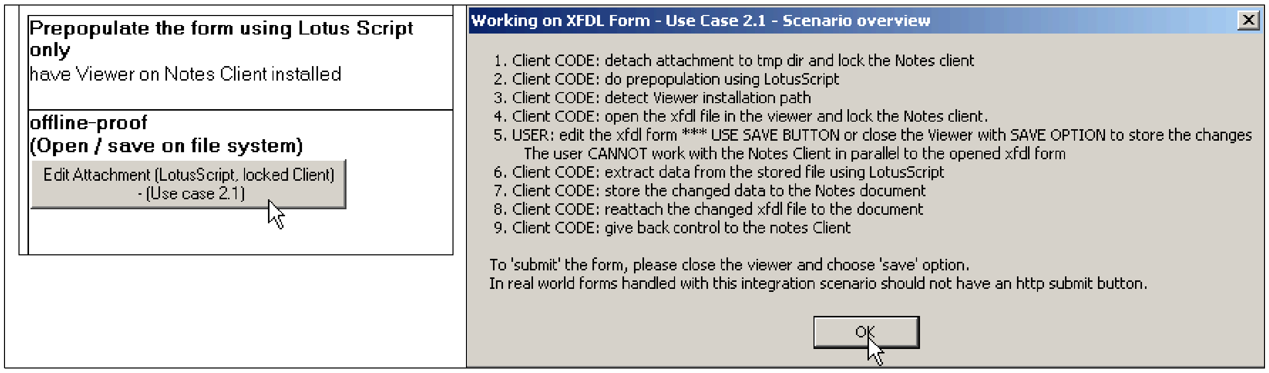
Table 9-9 Main functions called to edit an XFDL attachment

Function	Description
client_NewFromTemplate	**Functionality**: Creates a new Notes document based on the opened template document (called in the template button only, not on subsequent form edits to a filled form). In the new document, the unique IDs of the used template and the own unique ID are stored. All fields are copied from the template to the document. This should be changed for a production implementation (process a clean up) returns a handle to the new document. **Parameters** - none.

Function	Description
client_openXFDLForm	**Functionality**: Offers a choice list of file attachments (XFDL files) contained in the rich text field with the specified name in order to enable the user to edit the chosen attachment. Once the user closes the application in which the attachment was edited, the updated attachment is stored to the file system. The application to use is determined according to windows registry for the file extension. **Parameters:** attachmentFieldName As String Field name that stores the contained XFDL attachment to edit applied value: Body prepopType As String This entry defines the used technique for prepopulation and value extraction on the Notes Client. Available values: LotusScript or API. Applied value: LotusScript. In scenario 2 (use case 2.1 and 2.2) we use LotusScript only. documentHandling As String This entry controls the client behavior after the XFDL file is detached. Available values: lock, edit, or close. Applied value: lock. In use case 2.1 we use lock. useServer As Boolean This controls the rendering engine for the XFDL file to use. Available values: false (use Forms Viewer) or true (use Webform server). Applied value: false. The value true is used in use case 3.2 only. docIn As NotesDocument Handle to the document storing the XFDL file. Applied value: newly created document. Basically, the document storing the attachment can be any document in the database. In this document, the code writes the extracted values later on.

The QuotationRequest form contains a similar button. This form is intended to store filled forms in the workflow and completed forms. The only difference to the initiating button in the template is the missing call to create a new document (and a changed message box describing the use case).

Inspect the corresponding button in the form, as shown in Figure 9-48.


Prepopulate the form using Lotus Script only
have Viewer on Notes Client installed

offline-proof
(Open / save on file system)

Edit Attachment (LotusScript, locked Client) - (Use case 2.1)

Working on XFDL Form - Use Case 2.1 - Scenario overview

1. Client CODE: detach attachment to tmp dir and lock the Notes client
2. Client CODE: do prepopulation using LotusScript
3. Client CODE: detect Viewer installation path
4. Client CODE: open the xfdl file in the viewer and lock the Notes client.
5. USER: edit the xfdl form *** USE SAVE BUTTON or close the Viewer with SAVE OPTION to store the changes
   The user CANNOT work with the Notes Client in parallel to the opened xfdl form
6. Client CODE: extract data from the stored file using LotusScript
7. Client CODE: store the changed data to the Notes document
8. Client CODE: reattach the changed xfdl file to the document
9. Client CODE: give back control to the notes Client

To 'submit' the form, please close the viewer and choose 'save' option.
In real world forms handled with this integration scenario should not have an http submit button.

Figure 9-48 Invocation button to edit the XFDL form in Notes Client - use case 2.1

Attention: For the three use cases that we cover in this section, we use buttons to launch the attached XFDL file in the Forms Viewer. To automatically launch the attached form in the Forms Viewer when the Notes document is opened, move the code from the button to the PostOpen event of the form. If the form is configured as such, the document preview in the Notes document is the only way to inspect the Notes document. Using the PostOpen event, the document immediately opens the Forms Viewer before the user can access the document, so you might use the Preview pane in the Notes client to inspect the full Notes document or administer the stored Forms template in the locked client use case.

Scenario 2.1 attachment handling for the XFDL file

An overview of the most relevant functions used to process the XFDL file stored in the Notes document is given in Table 9-10. These actions cover the following:

- Detach to the file system before prepopulating.
- Start the Viewer with the current file.
- Reattach after value extraction.

The procedures listed in Table 9-10 are the kernel routines for these tasks.

Table 9-10 Main functions for XFDL file handling

Function	Description
file_detachAndEdit	**Functionality**: Detach a file from a specified item and edit the file in the associated application. ▸ Detaches the file from the document ▸ Calls the prepopulation ▸ Determines the application to start ▸ Starts the application **Parameters:** workdir As String, Temporary directory for file storage. AttName As String, Attachment name (file name stored with the attachment). InItem As String, Name of the rich text field storing the attachment. prepopType As String This entry defines the technique used for prepopulation and value extraction on the Notes Client. Available values: LotusScript or API. Applied value: LotusScript. In scenario 2 (use case 2.1 and 2.2) we use LotusScript only. useServer As Boolean This controls the rendering engine for the XFDL file to use. Available values: false (use Forms Viewer) or true (use Webform server). Applied value: false. The value true is used in use case 3.2 only. documentHandling As String This entry controls the client behavior after the XFDL file is detached. Available values: lock, edit, or close. Applied value: lock, In usecase 2.1 we use lock. doc As NotesDocument Handle to the document storing the attachment.

Function	Description

os_ShellAndWait	**Functionality**:
	This starts a new executable in a modal window in the Windows client using Windows API. This locks the calling application down to any use access until the called application is closed.
	The function is called from the module file_detachAndEdit with the following code:
	`If documentHandling ="lock" Then`
	`    '// Launch the file with the associated application`
	`    'and lock down the client`
	`    os_ShellAndWait ( <commandstring>")`
	`Else`
	`    '// Launch the file with the associated application`
	`    result = Shell ( <commandstring>, 1)`
	`End If`
	
	Parameters:
	RunProg As String
	Complete path to the called application and the attachment to edit.

file_reattachSavedXFDLForm	**Functionality**: Opens the XFDL file as string and attaches it to the target document/target files as mime type. We are using mime types here to be compliant with the attachment storage paradigm used in the submission servlet in scenario 1. **Parameters:** targetField As String, Name of the field to store the XFDL file. fpath As String, Path to the xfdl file on local file system. doc As NotesDocument Handle to the notesdocument to store the XFDL file.

Scenario 2.1 prepopulation

The prepopulation for scenario 2.1 is performed by the LotusScript procedures. We create text parsing routines taking similar arguments as the related Forms Java API methods to read and write data instances in the XFDL document. In detail, we are using the following functions to access the XFDL document stored as string in memory stored in LibFormsIntegration for this use case, as shown in Table 9-11.

Table 9-11 Main functions called to prepopulate a form using LotusScript

Function	Description
`forms_prepopLS`	**Functionality:** Processes form prepopulation using LotusScript. Processes the following tasks: ► It inspects the settings in four prepopulation tabs of the template document and updates the corresponding XML structures for the instances to prepopulate. ► Processes text parsing in the XFDL file according to any text parsing instructions in the template document. ► Updates the ConfigurationInfo instance with the current environment settings. **Parameters:** filePath As String, Path to the XFDL file. doc As NotesDocument, Handle to the document storing the attachment. template As NotesDocument Handle to the template from which the current document was created.
forms_prepopLSConfigInfo	**Functionality:** Dependent on the form type (XForms/XFDL), the function creates an XML structure to 'update the ConfigurationInfo instance (XForms Model) in the XFDL string OR 'writes entries as custom properties to the XFDL global.global section (XFDL documents) for the required environment information. In compressed forms, the function cannot work. The following values are stored to each opened form in this application: ► XFDLSubmissionURL - For HTTP PostSubmission samples - The target URL pointing to the submission servlet (name ProcessXFDL in the book). ► XFormsSubmissionURL - For XForms PostSubmissions for data gathering - Set submission URL. ► formID - For HTTP PostSubmission samples - Set formid from current DocumentUniqueID - This document will be updated when the form is submitted. ► dbpath - For HTTP PostSubmission samples - Set path to current database - The document will be searched in this DB. ► dominoForm- For HTTP PostSubmission samples - Set new form for the submitted document. ► instanceID - The data instance to retrieve on submission. **Parameters:** xfdl As String, The entire form stored in memory as string. doc As NotesDocument Handle to document storing the corresponding attachment.

Scenario 2.1 data extraction

The data extraction from the XFDL file is also performed by the LotusScript routines, as mentioned above. Table 9-12 contains a short description of these routines.

Table 9-12 Main functions called to extract data from an XFDL form using LotusScript

Function	Description
forms_extractDataLS	**Functionality:** Reads the form ID and the data instance ID from the submitted form. Next it extracts the assigned data instance as an XML fragment. All inner elements of the data instance are turned into field values and stored to the assigned document. **Parameters:** xfdl As String, Content of the updated xfdl file. doc As NotesDocument, Handle to the document storing the attachment - Here we paste in the new values.
forms_extractDataLS_extractInstance	**Functionality:** Searches in the entire XFDL content for the instance ID to extract. Returns the extracted inner XML of the instance. **Parameters:** `xfdl`, String containing the entire XFDL form. `instanceID` String containing the ID of the instance to extract.

9.10.2 Scenario 2.2 - local form handling with Viewer and LotusScript, with Notes client released

This use case contains a minor modification of the locked client use case (scenario 2.1). It allows the user to work in the Notes client during editing the XFDL form in another window, as shown in Figure 9-49.

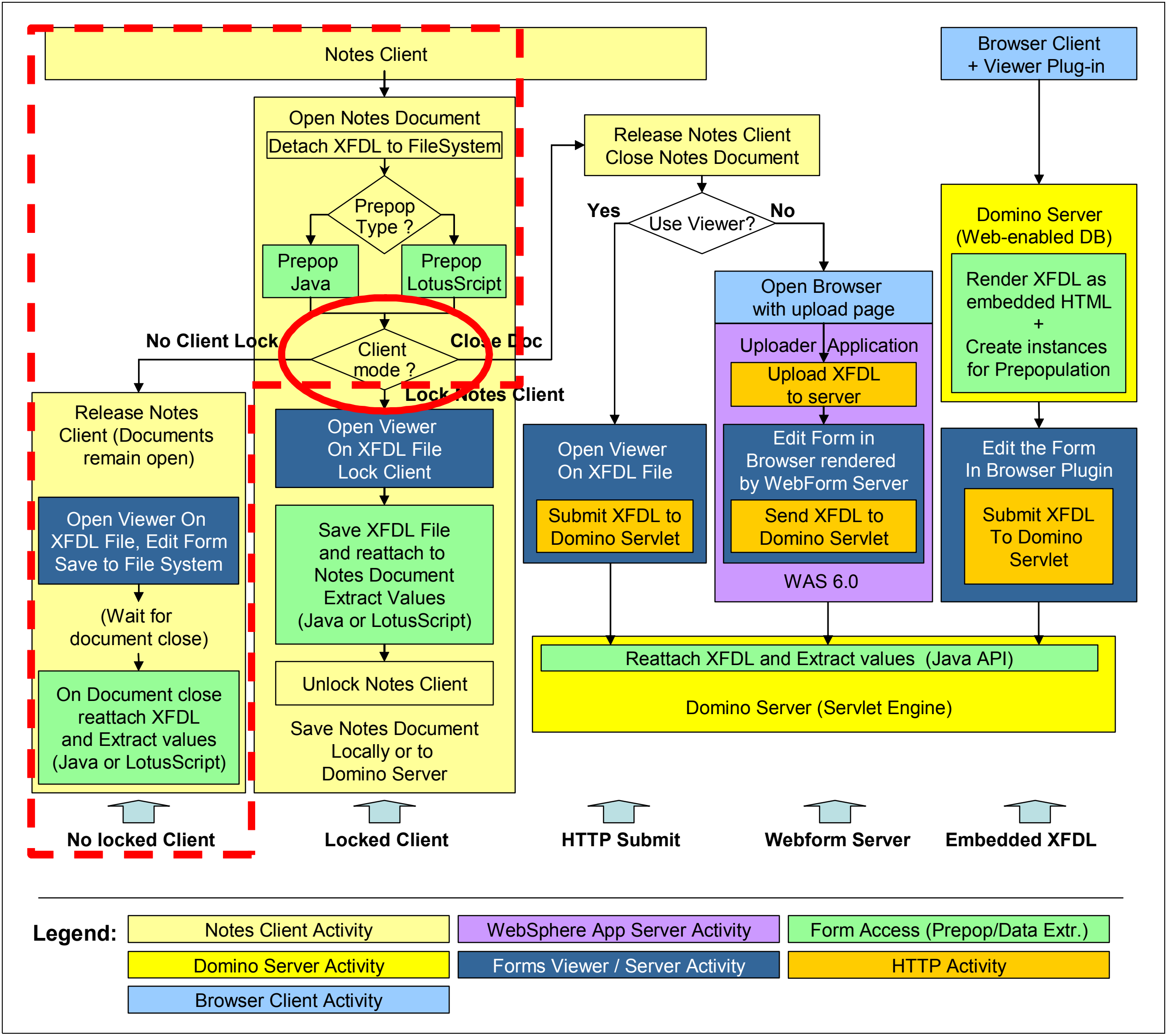

Notes Client
Browser Client + Viewer Plug-in
Open Notes Document
Detach XFDL to FileSystem
Prepop Type ?
Prepop Java
Prepop LotusSrcipt
Release Notes Client
Close Notes Document
Yes
Use Viewer?
No
Domino Server (Web-enabled DB)
Render XFDL as embedded HTML + Create instances for Prepopulation
Open Browser with upload page
Uploader Application
Upload XFDL to server
No Client Lock
Client mode ?
Close Doc
Lock Notes Client
Release Notes Client (Documents remain open)
Open Viewer On XFDL File Lock Client
Open Viewer On XFDL File
Submit XFDL to Domino Servlet
Edit Form in Browser rendered by WebForm Server
Send XFDL to Domino Servlet
WAS 6.0
Edit the Form In Browser Plugin
Submit XFDL To Domino Servlet
Open Viewer On XFDL File, Edit Form Save to File System
(Wait for document close)
On Document close reattach XFDL and Extract values (Java or LotusScript)
Save XFDL File and reattach to Notes Document Extract Values (Java or LotusScript)
Unlock Notes Client
Save Notes Document Locally or to Domino Server
Reattach XFDL and Extract values (Java API)
Domino Server (Servlet Engine)
No locked Client
Locked Client
HTTP Submit
Webform Server
Embedded XFDL
Legend:
Notes Client Activity
WebSphere App Server Activity
Form Access (Prepop/Data Extr.)
Domino Server Activity
Forms Viewer / Server Activity
HTTP Activity
Browser Client Activity

Figure 9-49 Domino environment use case overview - building scenario 2 use case 2.2 (Notes Client and Forms Viewer integration)

An unlocked client gives the end user a much better experience, but requires additional work for development:

- We have to take care of the opened XFDL form in the Viewer. When the user tries to close the Notes document containing the related attachment, we must prompt the user to finish the work in the Viewer.
- Re-attachment of the new version of the XFDL form now occurs on Notes document close, and not when the Viewer closes. Therefore, we must call the code stream for value extraction and reattaching the XFDL file with an additional procedure.

There are no new requirements to the installation on the Notes client or server.

The development for this use case results in the creation of the following objects:

- One new button that calls the XFDL handling routine with slightly changed parameters triggering the decision point "Client Mode?" marked with a red circle in the environment diagram in Figure 9-49 on page 589.
- One additional function (client_reattachXFDLForm) that performs value extraction and XFDL reattachment in the QueryClose event of the document.
- Minor changes to the forms that store the attachments to track the opened XFDL form (if any) and trigger the reattaching routine on document close.

The good news is that there are no new or changed requirements to the prepopulation/value extraction routines. This code and the file handling code is reused here.

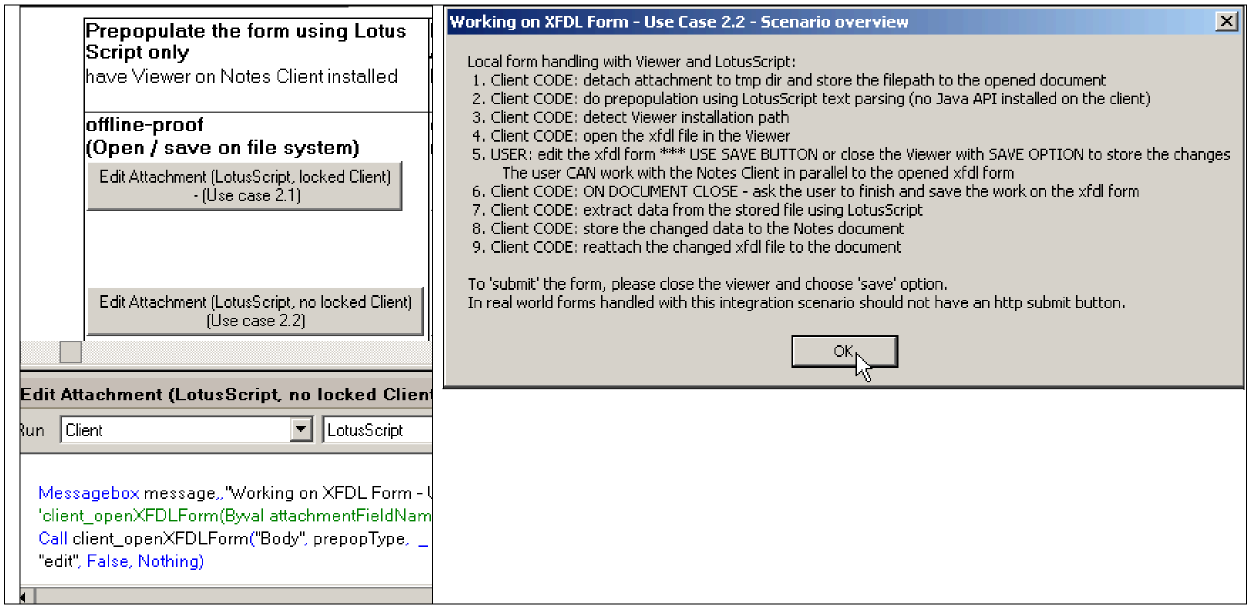
Note: In this scenario, the user can work with the Notes client in parallel with the opened XFDL file in the Viewer.

- When the Notes document is being closed, the user is asked to finish and save the work on the XFDL file.
- Next, extract the data from the saved XDFL file in the file system using the Java API agent, and save the extracted data to the current Notes document.
- Finally, re-attach the saved XFDL file, and save and close the Notes document.

We now go into detail and explore the code behind the prepopulation and data extraction of the XFDL file for scenario 2.2.

Scenario 2.2 development (Initiating buttons, flow control)

We create the new scenario only in the QuotationRequest form. Create a new copy of the button used in use case 2.1, and change the title and the parameter for the client mode from lock to edit, as shown in Figure 9-50.



Prepopulate the form using Lotus Script only
have Viewer on Notes Client installed
offline-proof
(Open / save on file system)
Edit Attachment (LotusScript, locked Client) - (Use case 2.1)
Edit Attachment (LotusScript, no locked Client) (Use case 2.2)
Edit Attachment (LotusScript, no locked Client
Run
Client
LotusScript
Working on XFDL Form - Use Case 2.2 - Scenario overview
OK

```
Messagebox message,,"Working on XFDL Form - U
'client_openXFDLForm(Byval attachmentFieldNam
Call client_openXFDLForm("Body", prepopType, _
"edit", False, Nothing)
```

```
Local form handling with Viewer and LotusScript:
 1. Client CODE: detach attachment to tmp dir and store the filepath to the opened document
 2. Client CODE: do prepopulation using LotusScript text parsing (no Java API installed on the client)
 3. Client CODE: detect Viewer installation path
 4. Client CODE: open the xfdl file in the Viewer
 5. USER: edit the xfdl form *** USE SAVE BUTTON or close the Viewer with SAVE OPTION to store the changes
       The user CAN work with the Notes Client in parallel to the opened xfdl form
 6. Client CODE: ON DOCUMENT CLOSE - ask the user to finish and save the work on the xfdl form
 7. Client CODE: extract data from the stored file using LotusScript
 8. Client CODE: store the changed data to the Notes document
 9. Client CODE: reattach the changed xfdl file to the document

To 'submit' the form, please close the viewer and choose 'save' option.
In real world forms handled with this integration scenario should not have an http submit button.
```

Figure 9-50 New button for use case 2.2 and the corresponding message box to display

To take care of opened forms from within the document, we add the following code to the postOpen and QueryClose events of the form, as shown in Example 9-28.

Example 9-28 Additional code in form events to track opened XFDL forms

```
Sub Postopen(Source As Notesuidocument)
         'clear list of opened attachments stored in the field openedAttachments
   source.Document.openedAttachment = ""

End Sub

Sub Querysave(Source As Notesuidocument, Continue As Variant)
   Call  client_reattachXFDLForm("Body", prepopType, continue)
End Sub
```

The function called in the QuerySave event is available in the library LibFormsIntegration and contains the code shown in Example 9-29.

Example 9-29 Function called in QuerySave event

```
Sub client_reattachXFDLForm(Byval targetField As String, extractType As String, 
continue As Variant)
   ’reattaches an opemend XFDL file, if there was one detached
   On Error Goto errorhandler
   Dim uidoc As notesuidocument
   Dim doc As notesdocument
   Dim fname As String
   Dim fpath As String
   Dim answer As Integer
   Dim message As String
   Dim ws As New notesuiworkspace

   'drill down to the opened  doc
   Set uidoc = ws.currentdocument
   Set doc = uidoc.document

   'any attachments opemend?
   fpath = doc.openedAttachment(0)
   If (fpath = "") Then Exit Sub 'no -> nothing to do

   'yes - ask to reattach
   fname = Strrightback(fpath, pathSep)
   Message = ""
   Message = Message + "You have edited a file attachment (" + fname + ")." + 
Chr$(10) + Chr$(10)
   Message = Message + "To close the document with the new version of the file "
   Message = Message + "make sure, the file is saved and called application 
closed." + Chr$(10) + Chr$(10)
   Message = Message + "If the called application is not closed yet, you can now 
switch there and finish the work on the attachment, before answering this dialog 
box." + Chr$(10) + Chr$(10)
   Message = Message + "Press   YES to reattach the edited file in the NEW 
VERSION" + Chr$(10)
   Message = Message + "Press   NO to close the document with the PREVIOUS VERSION 
of the file" + Chr$(10)
```

```
   Message = Message + "Press   CANCEL, if you do not want to close the document"
+ Chr$(10)

   answer = Messagebox (message, MB_ICONQUESTION + MB_YESNOCANCEL, "Reattach the
edited File " + fname)
   If answer = 7  Then 'no
      Exit Sub
   End If
   If answer = 2  Then 'cancel
      continue = False
      Exit Sub
   End If

   'OK - extract values and reattach
   Call  forms_extractData(fpath, doc, extractType)
   Call file_reattachSavedXFDLForm(targetField, fpath, doc)
   Call uidoc.reload

ex:
   Exit Sub
Errorhandler:
   Messagebox "Error " & Err() & " in " & Lsi_info(2) & " at line " & Erl() &
Chr$(10) & Error$
   Resume ex
End Sub
```

Now two functions must be implemented to make the use case complete:

1. On clicking the button, we must register the detached file.
2. In the code stream, we must use a different (not just blocking) statement to call the Viewer.

We implement both functionalities, as shown in Example 9-30, in LibFormsIntegration.

Example 9-30 Functions to handle detached file and Viewer edits

```
Sub client_openXFDLForm(Byval attachmentFieldName As String, prepopType As String,
documentHandling As String, useServer As Boolean, docIn As NotesDocument)

.....

   'if we will edit the form with no locked client and we are not going to use the
server
   If documentHandling = "edit"  Then
      uidoc.EditMode = True ’open the doc for editing
      doc.openedAttachment = WorkDir + pathSep + FileName$ ’register the
         attachment as open
      Exit Sub
   End If
.......
end sub

......
```

```
Function file_detachAndEdit (workdir As String, AttName As String , InItem As
String, prepopType As String, useServer As Boolean, documentHandling As String,
doc As NotesDocument)   As String

.....
      If documentHandling ="lock" Then
         os_ShellAndWait ( Cstr ( ExeFile ) & """" & Workdir   & pathSep & AttName
& """") '// Launch the file with the associated application and lock
         'down the client
      Else
         result = Shell ( Cstr ( ExeFile ) & " """ & Workdir   & pathSep & AttName
& """", 1) '// Launch the file with the associated application
      End If

......

end function
```

Scenario 2.2 is now complete. By opening a submitted form from the QuotationRequests view, we can now open an existing form, edit it, and switch back to the Notes Client. The following message boxes should appear:

- The standard Notes Client prompt when closing a document, as shown in Figure 9-51.
- If we choose to save the changes, an application-specific prompt to include the new Forms document version appears, as shown in Figure 9-52.

Both message boxes are shown below.

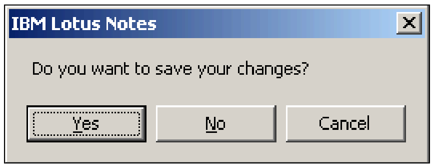
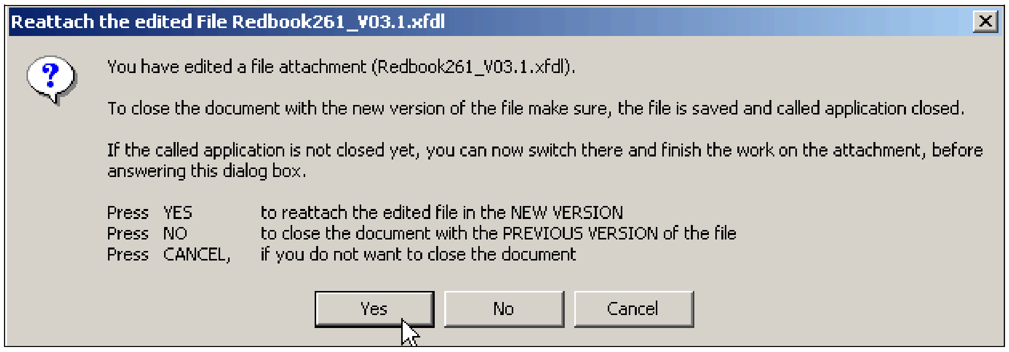


Figure 9-51 Standard Notes client prompt on closing an edited Notes document


Reattach the edited File Redbook261_V03.1.xfdl

You have edited a file attachment (Redbook261_V03.1.xfdl).

To close the document with the new version of the file make sure, the file is saved and called application closed.

If the called application is not closed yet, you can now switch there and finish the work on the attachment, before answering this dialog box.

Press	YES	to reattach the edited file in the NEW VERSION
Press	NO	to close the document with the PREVIOUS VERSION of the file
Press	CANCEL,	if you do not want to close the document

Figure 9-52 Application prompt to finish work on the opened attachment

If the Viewer is still open, the user can now finish the work on the form, close the Viewer, navigate back to the Notes client, and continue closing the document (by selecting the **Yes** button).

By answering the second message box with **Yes**, the routine client_reattachXFDLForm initiates value extraction and includes the new version of the XFDL file into the form.

If Cancel is selected, we stay with the opened Viewer and the opened Notes document.

If No, is selected, the Notes document closes with the previous version of the XFDL file included. The work in the opened Viewer is not saved and is lost.

9.10.3 Use Case 2.3 - local form handling with Viewer using Java API for prepopulation and value extraction

This use case shows another modification of the existing environment. The end user experience stays exactly the same. We just change the prepopulation and value extraction routines from a LotusScript-based implementation to a Java/Forms API based implementation. The diagram in Figure 9-53 illustrates this use case.

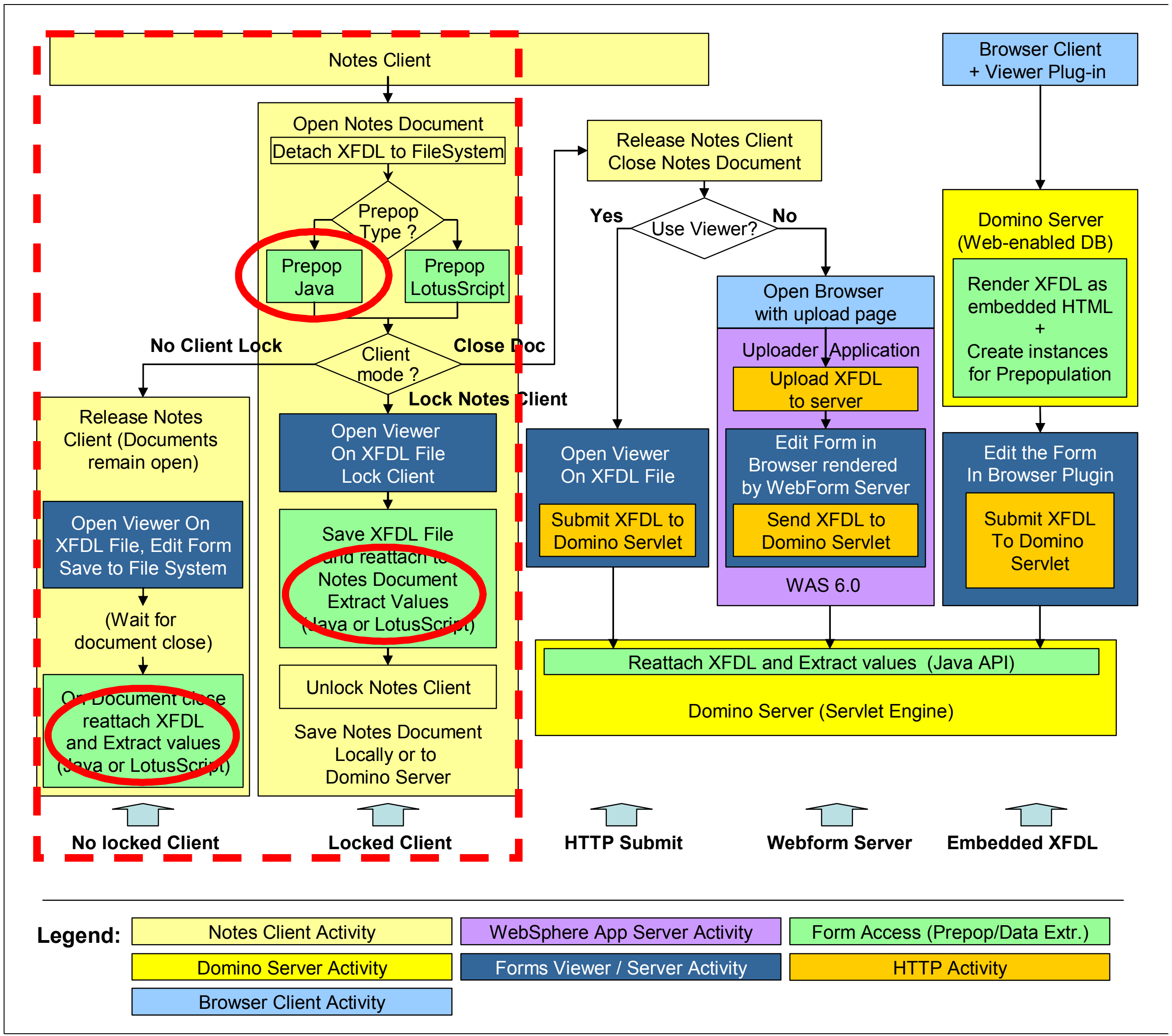

Notes Client
Open Notes Document
Detach XFDL to FileSystem
Prepop Type ?
Prepop Java
Prepop LotusSrcipt
No Client Lock
Client mode ?
Close Doc
Lock Notes Client
Release Notes Client (Documents remain open)
Open Viewer On XFDL File, Edit Form Save to File System
(Wait for document close)
On Document close reattach XFDL and Extract values (Java or LotusScript)
Open Viewer On XFDL File Lock Client
Save XFDL File and reattach to Notes Document Extract Values (Java or LotusScript)
Unlock Notes Client
Save Notes Document Locally or to Domino Server
No locked Client
Locked Client
Release Notes Client Close Notes Document
Yes
Use Viewer?
No
Open Viewer On XFDL File
Submit XFDL to Domino Servlet
Open Browser with upload page
Uploader Application
Upload XFDL to server
Edit Form in Browser rendered by WebForm Server
Send XFDL to Domino Servlet
WAS 6.0
Browser Client + Viewer Plug-in
Domino Server (Web-enabled DB)
Render XFDL as embedded HTML + Create instances for Prepopulation
Edit the Form In Browser Plugin
Submit XFDL To Domino Servlet
Reattach XFDL and Extract values (Java API)
Domino Server (Servlet Engine)
HTTP Submit
Webform Server
Embedded XFDL
Legend:
Notes Client Activity
WebSphere App Server Activity
Form Access (Prepop/Data Extr.)
Domino Server Activity
Forms Viewer / Server Activity
HTTP Activity
Browser Client Activity

Figure 9-53 Domino environment for Case 2.3 Notes Client and Forms Viewer integration using Java API to access XFDL form

Similar to the previous use case, we introduce a new parameter value to the initiating button (prepopType = "API") and review the related development work.

As previously mentioned, the complete code stream for the attachment handling stays the same (including the choices to work with a locked or unlocked Notes Client after opening the XFDL form in the Viewer).

The new functionality only affects the value prepopulation and value extraction routines. A Java agent is created to process the same logic. The advantage with this use case is that we can now use the Forms API to access the product in a recommended manner.

This use case adds new requirements to the Notes Client installation. If the installation has not been done, proceed with the following steps:

1. Install the Workplace Forms API Version 2.6.1 (which is included in the IBM Workplace Forms Server installation package), as recommended in the product documentation, on the client machine.
2. Make the Form API available to the Notes Client.
   - Copy the jar files from the Workplace Forms API to the <NotesProgramDir>\jvm\lib\ext directory, where <NotesProgramDir> is usually c:\notes. This ensures that Notes will find the files. The the jar files that should be copied are:
     - pw_api.jar
     - uiw_api.jar
     - pw_api_native.jar
     - uiw_api_native.jar

     OR
   - Ensure that the notes.ini file contains the following entry (adjust the path to your Forms API installation path):

     ```
     JavaUserClasses=c:\WIN2K\system32\PureEdge\70\java\classes\pe_api.jar;c:\WIN
     2K\system32\PureEdge\70\java\classes\uwi_api.jar;
     ```

Scenario 2.3 prepopulation with Forms Java API

The prepopulation for scenario 2.3 is done by the script library LibFormsIntegration written in LotusScript that is called by the Edit Attachment - Scenario 2.3 button.

Add a new button to the form template that executes the CopyFromNew action with the prepopulation using Java API.

The documentHandling parameter can be edit or lock. The code is shown in Example 9-31.

Example 9-31 Creating new forms from template using Forms Java API for prepopulation

```
Sub Click(Source As Button)

   isFirstOpen = True  'evaluate all prepopulation settings for first open
   prepopType = "API"
   Dim message As String
   message = "Local form handling with Viewer and LotusScript: " + Chr$(10)
.........
   message = message + Chr$(10)
   message = message + "To 'submit' the form, please close the viewer and choose
'save' option. " + Chr$(10)
   message = message + "In real world forms handled with this integration scenario
should not have an http submit button. " + Chr$(10)

   Messagebox message,,"Working on XFDL Form - Use Case 2.2 - Scenario overview"
```

```
   Dim newDoc As NotesDocument
   Set newDoc =  client_NewFromTemplate()

   'client_openXFDLForm(Byval attachmentFieldName As String, prepopType As String, 
documentHandling As String, useServer As Boolean, docIn As NotesDocument)
   Call client_openXFDLForm("Body", prepopType,  "edit", False, newDoc)

End Sub
```

Go to the script library LibFormsIntegration and open the script routine forms_prepop. It is called for prepopulation and implements the decision point about the prepopulation code to run depending on the prepopType parameter in the button.

If has the following skeleton code with the decision point exposed, as shown in Example 9-32.

Example 9-32   forms_prepop function

```
Sub forms_prepop(WorkDir As String, fileName As String, prepopType, doc As 
NotesDocument)

   On Error Goto Errorhandler
   ......
   'set prepop mode to opening document (we will need the settings for data 
extraction later on)
   doc.xfdlAccessMode = "prepop"

   If Instr(prepopType, "API") > 0  Then

   '**** here goes our new code for API based prepopulation
.....

   Elseif Instr(prepopType, "LotusScript") > 0 Then
      Call forms_prepopLS(WorkDir & pathSep &  FileName, doc, template)
   End If


ex:
   Exit Sub
Errorhandler:
   Messagebox "Error " & Err() & " in " & Lsi_info(2) & " at line " & Erl() & 
Chr$(10) & Error$
   Resume ex
End Sub
```

We cannot start a Java code directly from LotusScript, but we can run any agent from the script library. Therefore, the choice is easy: Write a Java agent and call it from this routine.

Tip: We explore another solution for this task: prepopulation using Notes/Domino LS2J functionality. This allows the execution of Java libraries directly from LotusScript and sharing common objects with the called Java code. We do not provide the corresponding code sample here, but the results are discussed in 9.12.2, "Language considerations (LotusScript versus Java versus LS2J)" on page 627.

However, there is another problem to resolve: Java is not able to execute the definitions of the prepopulation stored in the four prepopulation tabs of the template document containing

Notes @Formula expressions. Here the idea is to reuse prepopulation functionality already created for the browser scenario (scenario 1). We use the forms_createPrepopInstances function that creates rich text fields in a document. These fields contain the content of the instances for prepopulation according to the definition in the template document. If the new code runs this function on the current document, the Java agent has to copy the instances into the XFDL document, using the API. This is the way to go forward. The code to call the agent should look like Example 9-33.

Example 9-33 Calling a Java agent for XFDL Form prepopulation

```
   If Instr(prepopType, "API") > 0  Then
      'we assume, all prepopulation settings are contained in the template 
document.
      'this function will create a bunch of fields containing the instances to 
prepopulate
      'create instance data only (param formEmbedding = false)
      Call forms_createPrepopInstances(doc, template , False)
      Call doc.Save(True, True) ' write back all changes to the document, so we 
can read them with form the JAVA agent  from the server

      'now call Java agent to prepopulate the form.
      Dim ag As NotesAgent
      Set ag = doc.parentdatabase.getAgent("(JavaFormsAccessUsingAPI)")
      If  ag.run( doc.NoteID) <> 0 Then
         Messagebox "Problem! - Pre-population not executed"
      End If
      'cleanup prepopulation data from the form
      For i = 0 To MaxPrepopInstances
         fieldSuffix =""
         If i <> 0 Then fieldSuffix = "_" & i
      'remove prepop item, if any are found in the document
         While  doc.HasItem("Prepop" +  fieldSuffix)
            Call doc.RemoveItem("Prepop" +  fieldSuffix)
         Wend
         While  doc.HasItem("prepopulationPath" +  fieldSuffix)
            Call doc.RemoveItem("prepopulationPath" +  fieldSuffix)
         Wend

      Next

   Elseif Instr(prepopType, "LotusScript") > 0 Then
```

Most of the new code is used to clean up the opened document from the fields created during prepopulation. To overcome this, we could use a separate Notes document and delete it later on. This approach is not shown here.

Having the preparation for prepopulaton in place, we must write the Java agent that executes the content transfer into the XFDL file stored on the file system. We decide to create one common agent for prepopulation and value extraction. For now, we inspect the prepopulation part only. We create a Java agent named JavaFormsAccessUsingAPI with the code skeleton shown in Example 9-34.

The beginning part of the code shows how to obtain the specific data from the related document, the middle part shows how to initialize the Forms API, and the last part is the business logic (to be created) and the cleanup.

Example 9-34 JavaFormsAccessUsingAPI Java agent

```
import lotus.domino.*;
import com.PureEdge.DTK;
import com.PureEdge.IFSSingleton;
import com.PureEdge.error.UWIException;
import com.PureEdge.xfdl.FormNodeP;
import com.PureEdge.xfdl.XFDL;
import java.text.MessageFormat;
import java.net.*;
import java.io.*;

public class JavaAgent extends AgentBase {
   static String debugMode = "on";
   static String sv = "JavaFormsAccessUsingAPI";
   static int maxPrepopInstances = 4;

   //Custom value for flag parameter in .readForm API call
   private static final int READFORM_XFORMS_INIT_ONLY = (XFDL.UFL_SERVER_SPEED_FLAGS &
         (~XFDL.UFL_XFORMS_OFF) | XFDL.UFL_XFORMS_INITIALIZE_ONLY);

   public void NotesMain() {
      String filePath = "";
      String mode = "";

      URL u;
            Database db = null;
            Document doc = null;
      try {
          p( "Start  Java Agent");
         Session session = getSession();
         p( "session OK");
         AgentContext agentContext = session.getAgentContext();
         db = agentContext.getCurrentDatabase();
         p( "db OK");
         Agent agent = agentContext.getCurrentAgent();
         // Get document used for passing data
         doc = db.getDocumentByID(agent.getParameterDocID());
         p( "doc OK");
         filePath = doc.getItemValueString("filePath");
         mode = doc.getItemValueString("xfdlAccessMode");
         String form = doc.getItemValueString("form");

         // initialize the IBM Workplace Forms Server API
         p( "Start  Forms API ");
         try {
```

```
      DTK.initializeWithLocale("Notes Client Integration", "1.0.0",
            "7.0.0", null);
      p( "DTK OK");
   } catch (UWIException e) {
      String pattern = "Failed to initialize IBM Workplace Forms API";
      Object[] tokens = { (e.getStackTraceString()) };
      String message = MessageFormat.format(pattern, tokens);
      p( "ERROR: " + message);
      p( e.toString());
      NotesThread.stermThread();
      p(  "END");
   }

      // Load the form
      XFDL theXFDL = null;
      theXFDL = IFSSingleton.getXFDL();
      p(  "IFSSIngelton OK");
       if(theXFDL == null) throw new Exception("Could not find interface");
      FormNodeP theForm = theXFDL.readForm(filePath,READFORM_XFORMS_INIT_ONLY);
      p(  "theForm OK");
      //***************************************************************
      // OK - here we have all prerequisits loaded to start work on XFDL
      //***************************************************************
      //exeute form specific code for prepop and extract
         if (mode.equals("prepop")) {
         doPrepop(doc, theForm);
         theForm.writeForm(filePath, null, 0);
         p(  "writeForm OK");
         }
      if (mode.equals("extract")) {
         doExtract(doc, theForm, session);
          p( "extract OK");
         }
      //***************************************************************
      // OK - work on XFDL done
      //***************************************************************

   doc.recycle();
   db.recycle();
   p(  "Terminate");
   NotesThread.stermThread();
   p(  "END");
   } catch(Exception e) {
      p( "ERROR: " + e.getMessage());
       e.printStackTrace();
      p( e.toString());
      NotesThread.stermThread();
      p(  "END");
   }
}

//form specific prepopulation code
static void doPrepop(Document doc, FormNodeP theForm) {
      p(  "prepopulation OK");
return;
   }
   //form specific data extraction routine
   static void doExtract(Document doc, FormNodeP theForm,Session s) {

      p(  "data extraction OK");
   return ;
   }
      p(  "data extraction OK");

}
```

The code that goes into the doPrepop routine is simple. We execute a loop over all instances to prepopulate. If we find the related fields, we call a helper function to populate the instance, as shown in Example 9-35.

Example 9-35 doPrepop routine copying the instance content from the Notes document into XFDL file

```
static void doPrepop(Document doc, FormNodeP theForm) {
            String instanceData = "";
            String pathToItem = "";

         try {

         /*****************************************************************
         * put here your form secific code - BEGIN
         *****************************************************************/
   for (int i = 0; i <= maxPrepopInstances + 1; i++) {
      //walk through all created prepopulation fields and apply the data if
      //not empty
      String suffix = "";
      if (i != 0) suffix = "_" + i;

         if (doc.hasItem("Prepop" +  suffix) && doc.hasItem("prepopulationPath" +
               suffix)) {
            instanceData = doc.getItemValueString("Prepop" +  suffix);

            RichTextItem prepop =  (RichTextItem)doc.getFirstItem("Prepop" +
               suffix);
                instanceData = prepop.getFormattedText(false, 10000, 0);
            pathToItem = doc.getItemValueString("prepopulationPath" +  suffix);

            //System.out.println("Instance " + i + " " + instanceData);
            //System.out.println("Instance " + i + " " + pathToItem );

            if (! pathToItem.equals("")) {
               if (pathToItem.indexOf("'") > 0){
                  //this is an XPath - update the XForms instance
                   setFormValue(theForm, pathToItem, instanceData) ;
                  } else {
                  //this is NO XPath - update the XML instance
                  setFormValue(theForm, pathToItem, instanceData) ;
               }
            }
         }
      }

      p(  "prepopulation OK");

         /*************************************************************
         * put here your form secific code - END
         *************************************************************/

         return ;
      } catch(Exception e) {
         p( "Error: " + e.getMessage());
         e.printStackTrace();
         p( e.toString());
         NotesThread.stermThread();
         p(  "ENDE" );
         return;
      }
   }
```

The helper function setFormValue, as shown in Example 9-36, is taken from the J2EE environment. It can operate on XForms instances and XFDL values.

Example 9-36 The helper function setFormValue (re-used from J2EE environment)

```
   /**
    * sets one value in the xfdl form addressed by an item reference
    * dependent on the syntax in pathToItem parameter, the code will access an
    * XFDL item or data in an XForms instance
    *
    * @param theForm
    * @param pathToItem (XPath expression to an XForms instance or XFDL path)
    * @param value
    */
   public static void setFormValue(FormNodeP theForm, String pathToItem, String 
value) {
      try {
         System.out.println("setFormValue" + 
"================================================");
         System.out.println(pathToItem);
         System.out.println(value);
         if (pathToItem.indexOf("instance('") == 0){
            String element = "";
            if (pathToItem.indexOf("/")>0)
               pathToItem.substring(pathToItem.lastIndexOf("/")+1, 
pathToItem.length());
            String updateXML = value;
            if (!element.equals("")){ //we are going to replace an inner element 
-> add the element tags!!!

               if (element.indexOf("[")>0) {element = 
element.substring(0,element.indexOf("["));}
               updateXML = "<" + element + ">" + value + "</" + element + ">";
            }
            p("updateXML:" + updateXML);
            StringReader r = new StringReader(updateXML);
            //update data instance from xfdl as stream
            theForm.updateXFormsInstance(null, pathToItem ,null, r, 
XFDL.UFL_XFORMS_UPDATE_REPLACE);
            //String tmp = getFormValue(theForm, pathToItem,"");
         } else {
            theForm.setLiteralByRefEx(null, pathToItem, 0, null, null, value);
            p("setFormValue: " + pathToItem + " -> [" + value + "] - done");
         }

      } catch (UWIException e) {
         p ("FAILED to update XForms instance: " + pathToItem );
         e.printStackTrace();
      }
      return;
   }
```

This completes the development for the Java API based prepopulation.

Scenario 2.3 - data extraction

Data extraction using the Java API is already done, too, in the submission servlet used in the Domino scenario 1 using the browser client. We reuse the code here.

Let us remember the basic idea of value extraction here: extracting the data instance, we get an XML fragment. This fragment gets adopted to fit the data structure of Domino DXLImporter. The importer can create or update any Notes documents with the content of an XML structure, transferring the element values into Domino field values.

In a high level this is what we need, but we cannot write to the document currently opened in the end user's Notes client. Saving the document, the user would overwrite the just retrieved information. So we use a work around: we create a new blank document and let the DXL parser put the values in.

After the agent finishes the work, we get control back to the calling LotusScript library. Here we can transfer the values to the document opened in UI and delete the transfer document.

Therefore, we have the following development tasks:

- Create the decision point to branch to Java API, if prepop type is set to API.
- Create the agent call for the Java Agent and the value transfer from the temporary document into the current document.
- Create the doExtract routine in the agent reusing the servlet code.

Let us start with the new elements in LotusScript library LibFormsIntegration. Glance at the routine forms_extractData shown in Example 9-37. This implements the decision point for data extraction technology to use. The code skeleton is similar to the decision point for form prepopulaton.

Example 9-37 Sub forms_extractData decision point

```
Sub  forms_extractData( filePath As String, doc As NotesDocument, extractType As 
String)
   'Form data extraction handler run in client environment
   'branches to LS data extraction or Java API extraction according to extractType 
value
   'stores ta data to the document referenced as doc
   On Error Goto Errorhandler

   'return, if not a xfdl of xfd file
   If Instr(Lcase(filepath)+"$$", ".xfdl$$") = 0 And  Instr(Lcase(filepath)+"$$", 
".xfd$$") = 0  Then Exit Sub

   'if we have no input on ectractType - readit from the document
   'This is the case in released client usecases
   If extractType = "" Then extractType = doc. prepopType(0)

   If Instr(extractType, "API") > 0  Then
      '**** do Java API data extraction

   Elseif Instr(extractType, "LotusScript") > 0  Then
      '**** do LotusScript data extraction
   End If

ex:
   Exit Sub
Errorhandler:
   Messagebox "Error " & Err() & " in " & Lsi_info(2) & " at line " & Erl() & 
Chr$(10) & Error$
   Resume ex
End Sub
```

The Java API related code should call the created agent (with the option to extract data) and transfer the extracted data from the temporary document to the target document. These are a few lines of code only, as shown in Example 9-38.

Example 9-38 Calls for Java API related data extraction in forms_extractData

```
   If Instr(extractType, "API") > 0  Then
      '**** do Java API data extraction
      'set the operation mode for the agent to "extract"
      doc.xfdlAccessMode = "extract"
      'be aware - the user could edit the document in parallel to editing the form
      Call doc.Save(True, True) ' write back mode all changes to the document,
      'call the agent
      Dim ag As NotesAgent
      Set ag = doc.parentdatabase.getAgent("(JavaFormsAccessUsingAPI)")
      If  ag.run( doc.NoteID) <> 0 Then
         Messagebox "Problem!"
      End If

      'copy the results
      Call forms_copyExtractedData(doc, extractType)
      'clean up
      Call doc.RemoveItem("xfdlAccessMode")

   Elseif Instr(extractType, "LotusScript") > 0  Then
      '**** do LotusScript data extraction
   End If

.....

'*** helper function to copy the results
```

```
Sub forms_copyExtractedData(doc As NotesDocument, mode As String)
   'copies the data extracted to a temporary document to the originating document
   'called in API use cases where a Java agent creates temp docs to store
extracted data

   On Error Goto Errorhandler
   Dim tmpDoc As NotesDocument
   Dim coll As NotesDocumentcollection

   'read the values from a specific response document
   Set coll = doc.Responses
   If coll.Count > 0 Then
      Set tmpDoc = coll.GetFirstDocument
      While Not tmpDoc Is Nothing
         If tmpDoc.GetItemValue("$FormData")(0) = "true" Then
            Forall item In tmpdoc.Items
               If Instr(item.name, "$") <> 1 Then
                  Call doc.ReplaceItemValue(item.name,
                     tmpDoc.getItemValue(item.name))
                     'Messagebox "copy " & item.name & " " &  Instr(item.name,_
                        "$")
               End If
            End Forall
            Call tmpDoc.Remove(True)
            Set tmpDoc = Nothing
         Else
            Set doc = coll.GetNextDocument(doc)
         End If
      Wend
   End If


   Exit Sub
ex:
Errorhandler:
   Messagebox "Error " & Err() & " in " & Lsi_info(2) & " at line " & Erl() &
Chr$(10) & Error$
   Resume ex
End Sub
```

Now we inspect the Java agent code for data extraction. The original code was taken from the Domino submission servlet, so we look only at the places we had to adapt, not at the entire code.

The original code working in the servlet always had to update the target document directly. We cannot do so here, because this document is just opened in the UI. Changes in the database would cause save conflicts, so we are going to create a new document as a target to extract the data. This action requires three steps to work:

1. Create the new document in the target database and make it a response to the target document.
2. Save it and remember the UniqueID.
3. Run the DXL Importer with the extracted UniqueID to fill the data into this document.

These are exactly the places we had to adapt for the Java API data extraction. The code is shown in Example 9-39.

Example 9-39 Code adjustments for data extraction to a temporary document (doExtract method)

```
   //form specific data extraction routine
   static void doExtract(Document doc, FormNodeP theForm,Session s) {

         String dbPath = "";
         String instanceID = "";
         String dominoForm = "";
         //***** new for temporary document to extract data
         String tmpUNID = "";
.....
         //***** new for temporary document to extract data
         Document tmpDoc = doc.getParentDatabase().createDocument();
         tmpDoc.replaceItemValue("$FormData", "true");
         tmpDoc.makeResponse(doc);
         tmpDoc.save(true, true);
         tmpUNID = tmpDoc.getUniversalID();
.....
         //createImporterXML composes an xml string for DXLImporter to
         // insert/update a doc
         //***** changed for temporary document to extract data
            //(tmpUNID in place of UNID)
         debugOut(" import XML: "
                  + createImporterXML(piStr, dominoForm, replID, tmpUNID));
         stream.write(createImporterXML(piStr,dominoForm, replID, tmpUNID)
                  .getBytes());
         debugOut(" Stream filled");
```

That is all that we have to change. Data extraction development is now complete.

There are no other changes to the environment. Make sure that the Forms Java API is available to Notes Client and test it with the new code stream.

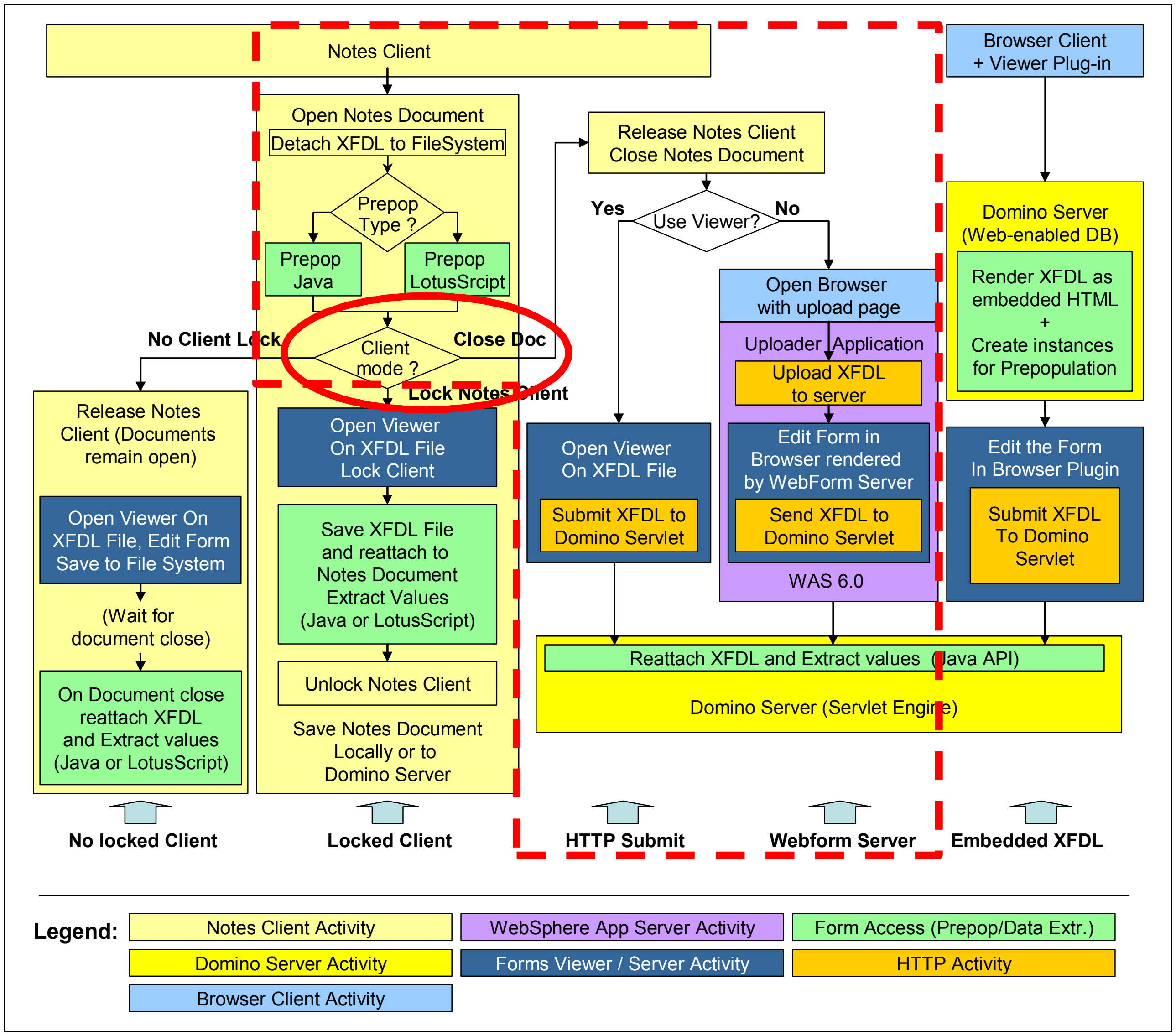
Tip: In the Redbooks resources, we create a CopyFromNew button for the Java API based scenario as well. There are no further implications. Just copy the initiation button for the use case 2.1 and change the prepopType parameter (LotusScript → API).

There a no new figures in this scenario, because the user interface is not affected by the provided changes.

Tip: Turn on the Java debug console to see the debug output.

9.11 Scenario 3 - Domino integration using HTTP submissions for completed forms

This section covers two new use cases starting with a Notes Client based form initiation (any prepopulation type like using LotusScript or Forms Java API). The difference from the Notes Client based use cases that we explored in scenario 2 is that we use a HTTP submit button in the form now to finish the work in it, as in all J2EE scenarios and the browser-based scenario for Domino integration.



Notes Client
Browser Client + Viewer Plug-in
Open Notes Document
Detach XFDL to FileSystem
Prepop Type ?
Prepop Java
Prepop LotusSrcipt
Release Notes Client Close Notes Document
Yes
Use Viewer?
No
Domino Server (Web-enabled DB)
Render XFDL as embedded HTML + Create instances for Prepopulation
Open Browser with upload page
Uploader Application
Upload XFDL to server
No Client Lock
Client mode ?
Close Doc
Lock Notes Client
Release Notes Client (Documents remain open)
Open Viewer On XFDL File Lock Client
Open Viewer On XFDL File
Edit Form in Browser rendered by WebForm Server
Edit the Form In Browser Plugin
Open Viewer On XFDL File, Edit Form Save to File System
Save XFDL File and reattach to Notes Document Extract Values (Java or LotusScript)
Submit XFDL to Domino Servlet
Send XFDL to Domino Servlet
Submit XFDL To Domino Servlet
(Wait for document close)
WAS 6.0
On Document close reattach XFDL and Extract values (Java or LotusScript)
Unlock Notes Client
Reattach XFDL and Extract values (Java API)
Domino Server (Servlet Engine)
Save Notes Document Locally or to Domino Server
No locked Client
Locked Client
HTTP Submit
Webform Server
Embedded XFDL
Legend:
Notes Client Activity
WebSphere App Server Activity
Form Access (Prepop/Data Extr.)
Domino Server Activity
Forms Viewer / Server Activity
HTTP Activity
Browser Client Activity

Figure 9-54 Domino environment use case overview - building scenario 3 (Notes Client with HTTP submission of form)

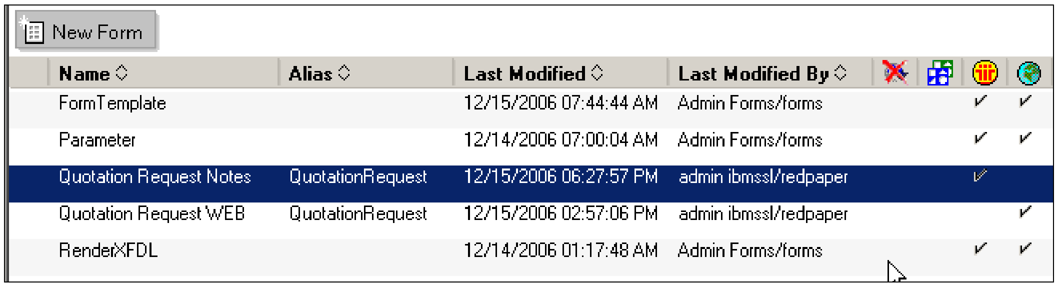
Figure 9-54 shows how we are going to serve two different use cases. The HTTP Submit use case (3.1) is an outcome of the development work that we have already done. It combines the client-based prepopulation part (released Notes Client) with the use of a HTTP submit button right in the XFDL form, as in Domino scenario 1 and all Web application based scenarios from Chapter 6, “Building the base scenario: stage 2” on page 367. You may have already used this button (rather by accident) in the sample form evaluating a use case from Domino scenario 2. In all scenario 2 use cases we agreed to store completed forms using a file save. Taking the browser-aimed forms in the Domino client scenarios here, we did not remove the submit button. Hence, pressing it would cause a HTTP submit as in scenario 1. Having the submission servlet from scenario 1 in place, the xfdl form is routed to the servlet, processed, and stored to the Domino database. We are not sure about the practical value of that use case, but it is our entry point to the Zero Footprint scenario.

The Webform Server use case (3.2) is much more important. This use case can serve any end-user desktop working with the Notes Client and a browser, but without any Forms Viewer installation.

There are some common implications to consider for both scenarios:

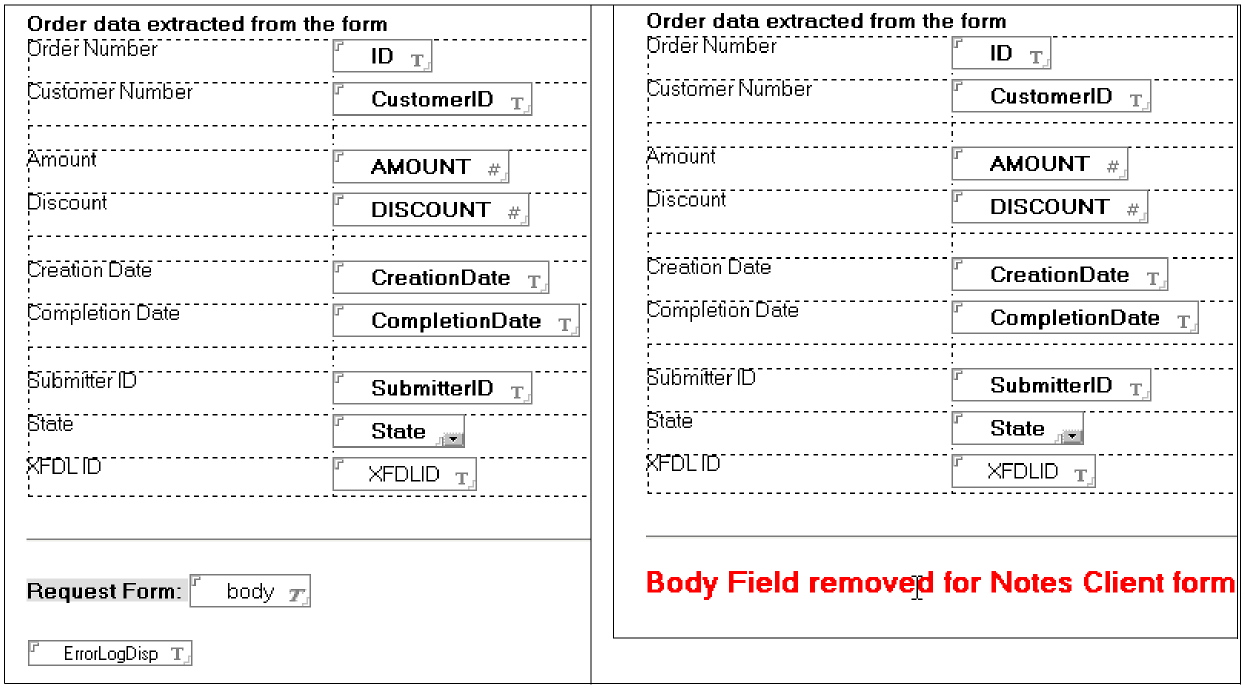
- Using a HTTP servlet for submission handling in a Notes Client based use case, it is very easy to produce replication conflicts (for example, just editing a document on the client while the servlet updates a replica of the document on server. We have to avoid those pitfalls using different techniques.).
- In a mixed environment, the application updates the XFDL document stored in the Notes document by sometimes using the servlet (working in the back end with the Notes document) and in other edit cycles with LotusScript in the UI. We have to make sure that the different storage procedures attach the new version of the file in a compatible format.

For the document storage problem (avoiding incompatible versions of the stored XFDL file after servlet submissions and attachment update in the Notes Client UI), there are different solutions. In this book, we create separate versions of the QuotationRequest form for Web UI and Notes Client, as shown in Figure 9-55 and Figure 9-56 on page 608. The version of the Notes Client shows the created initiation buttons, but has no field in the form for the attachment. This makes the script-based routine for attachment handling running like in a back-end mode and presents the attached file *at the end* of the Domino form, preventing it from being edited with standard Notes tools.



Name	Alias	Last Modified	Last Modified By				
FormTemplate		12/15/2006 07:44:44 AM	Admin Forms/forms			✓	✓
Parameter		12/14/2006 07:00:04 AM	Admin Forms/forms			✓	✓
Quotation Request Notes	QuotationRequest	12/15/2006 06:27:57 PM	admin ibmssl/redpaper			✓	
Quotation Request WEB	QuotationRequest	12/15/2006 02:57:06 PM	admin ibmssl/redpaper				✓
RenderXFDL		12/14/2006 01:17:48 AM	Admin Forms/forms			✓	✓

Figure 9-55 Splitting QuotationRequest form in a Web and a Notes Client version


Order data extracted from the form

Order Number	ID
Customer Number	CustomerID
Amount	AMOUNT
Discount	DISCOUNT
Creation Date	CreationDate
Completion Date	CompletionDate
Submitter ID	SubmitterID
State	State
XFDL ID	XFDLID

Request Form: body

ErrorLogDisp

Order data extracted from the form

Order Number	ID
Customer Number	CustomerID
Amount	AMOUNT
Discount	DISCOUNT
Creation Date	CreationDate
Completion Date	CompletionDate
Submitter ID	SubmitterID
State	State
XFDL ID	XFDLID

Body Field removed for Notes Client form

Figure 9-56 Different form layout for Web client (left pane) and Notes Client (right pane)

Tip: Other possible solutions are:

- Processing an additional attachment conversion after the document is closed (for example, in the postSave event)
- Changing the file storage conversion from mime types to simple Domino attachments in both the LotusScript routines and the servlet code
- Storing the XFDL file in any other place but the document opened in the Notes client.

There is no code provided in this book for these solutions.

To overcome the risk of replication conflicts, multiple actions should be applied:

- Ensure that the Notes document is closed when the user starts to edit the XFDL form while the servlet is intended to update the form and store the extracted data on the server. We do so by implementing a new documentHandling option: close. It closes the opened document when the user activates the from editing button.
- Make sure that there are no distributed (not clustered) replicas of the documents in your system that are potentially edited by the Domino servlet (or be sure not to update with the servlet any field available for changes to other application parts). Here are a some ideas to ensure that documents are not updated incorrectly:
  – Have all replicas of the database in a high speed cluster. Do not allow any local replicas of the database.
  – Make sure that the submission servlet does not update existing documents (for example, creating on each submit new documents). They might be attached as new response documents to a common root document for each available form.
  – Store attachments and update information in a common centralized repository, not in the documents available to the end user.

Having the environment secure, we can start to build the two available use cases in this scenario.

For all use cases in this scenario, we have new requirements to the Domino server installation. Similar to the scenario 1, we have to run the Domino servlet on the server.

9.11.1 Scenario 3 - server installation

The following steps illustrate what needs to be done to set up the server machine for our implementations of the use cases for scenario 3 that uses the server as an end point to submit completed XFDL forms.

1. Install Domino Server Version 6.x or 7.x on the server machine.
2. Activate HTTP and the Domino Servlet Engine on the server machine.
3. Install the Workplace Forms API Version 2.6.1 (which is included in the IBM Workplace Forms Server installation package), as recommended in the product documentation, on the server machine.
4. Make the Forms API available for the Domino Server JVM.
   - Copy the jar files from the Workplace Forms API to the <DominoServerProgramDir>\jbm\lib\ext directory, where <NotesProgramDir> is the directory where the Domino Server in installed. This ensures that Domino will find the files. The jar files that should be copied are:
     - pw_api.jar
     - uiw_api.jar
     - pw_api_native.jar
     - uiw_api_native.jar

     OR
   - Ensure that the notes.ini file contains the following entry:

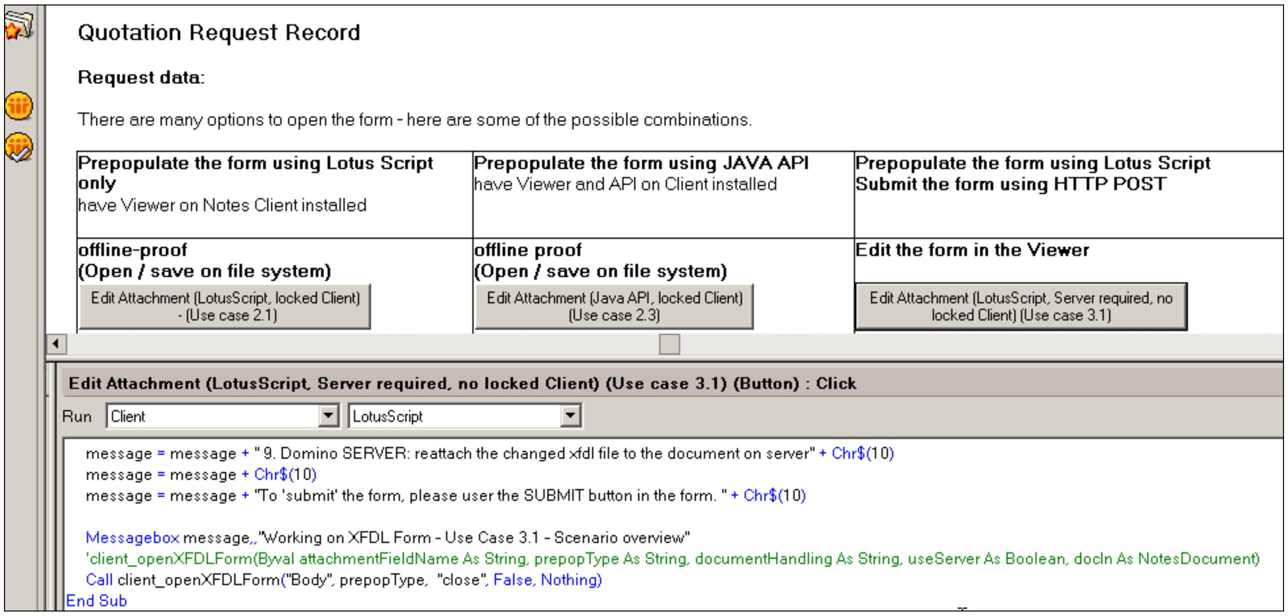
     ```
     JavaUserClasses=c:\WIN2K\system32\PureEdge\70\java\classes\pe_api.jar;c:\WIN
     2K\system32\PureEdge\70\java\classes\uwi_api.jar;
     ```
5. Copy the Notes database to the server.
6. Open the database and go to the Parameter view. Adjust the parameters for the server URL and submission URL to your environment. (The server name should reflect the name of the current server. All other settings can stay unchanged. Double-check the path to the Notes database.)
7. Install the submission servlet on the server. The servlet receives HTTP post submissions from the Viewer and does the necessary data extractions. Place the servlet class file in the <DominoDataRoot>/Domino/Servlet directory.
8. Place the servlets.properties file in the <DominoDataRoot> directory. Both the servlet class file and the servlets.properties file can be downloaded from Appendix D, "Additional material" on page 693.
9. Restart the HTTP task on the Domino server.

9.11.2 Use case 3.1 - Notes Client/Forms Viewer based initiation, server-based submission

Use case 3.1 just *happens* if we build any of the use cases in scenario 2 (Notes Client initiated work with an XFDL form in Forms Viewer) and we do not remove the buttons with type *done* (XDFL submissions submitting the entire form to an URL and closing the form in the Viewer).

When the end user clicks this button, the form gets submitted to the Domino servlet (assuming the parameter document for the SubmissionURL has the matching value) and the form closes down in the Viewer.

All we have to make sure in the application is that we close the related Notes document, since the servlet is going to update it. We can ensure this by using the document handling parameter with the value *close*. Compare the code for the new initiation button, as shown in Figure 9-57.



Quotation Request Record

Request data:

There are many options to open the form - here are some of the possible combinations.

Prepopulate the form using Lotus Script only have Viewer on Notes Client installed	**Prepopulate the form using JAVA API** have Viewer and API on Client installed	**Prepopulate the form using Lotus Script** **Submit the form using HTTP POST**
offline-proof **(Open / save on file system)** Edit Attachment (LotusScript, locked Client) - (Use case 2.1)	**offline proof** **(Open / save on file system)** Edit Attachment (Java API, locked Client) (Use case 2.3)	**Edit the form in the Viewer** Edit Attachment (LotusScript, Server required, no locked Client) (Use case 3.1)

Edit Attachment (LotusScript, Server required, no locked Client) (Use case 3.1) (Button) : Click

Run: Client | LotusScript

```
    message = message + " 9. Domino SERVER: reattach the changed xfdl file to the document on server" + Chr$(10)
    message = message + Chr$(10)
    message = message + "To 'submit' the form, please user the SUBMIT button in the form. " + Chr$(10)

    Messagebox message,,"Working on XFDL Form - Use Case 3.1 - Scenario overview"
    'client_openXFDLForm(Byval attachmentFieldName As String, prepopType As String, documentHandling As String, useServer As Boolean, docIn As NotesDocument)
    Call client_openXFDLForm("Body", prepopType,  "close", False, Nothing)
End Sub
```

Figure 9-57 Initiation button for scenario 3.1 (Notes Client, Forms Viewer, XFDL HTTP submissions)

Example 9-40 Code for initiation button for scenario 3.1 (Notes Client, Forms Viewer, XFDL HTTP submissions)

```
Sub Click(Source As Button)
   prepopType = "LotusScript"
   Dim message As String
   message = "Server based form handling with Viewer and LotusScript: " + Chr$(10)
   message = message + " 1. Client .......
   message = message + Chr$(10)
   message = message + "To 'submit' the form, please user the SUBMIT button in the 
form. " + Chr$(10)

   Messagebox message,,"Working on XFDL Form - Use Case 3.1 - Scenario overview"
   'client_openXFDLForm(Byval attachmentFieldName As String, prepopType As String, 
documentHandling As String, useServer As Boolean, docIn As NotesDocument)
   Call client_openXFDLForm("Body", prepopType,  "close", False, Nothing)
End Sub
```

All of the points in the outline are handled by the code behind the Edit Attachment - Scenario 3.1 button, as shown in Example 9-40. To test the scenario:

1. Open the Notes document and click the **Edit Attachment - Scenario 3.1** button.
2. The attached XFDL file is detached to a temp directory on the client machine.
3. The prepopulation of the detached XDFL file is performed using LotusScript text parsing.

4. The installation path of the Forms Viewer is detected, and the XFDL file is opened in the Forms Viewer.
5. The user can now edit the XFDL file in the Viewer. The initially opened Notes document is closed by script. In this scenario, the Notes document is closed immediately and the Notes client is not locked.
6. To complete the work in the form, the end user should send the new version of the XFDL file using the **Submit** button. The Submit button submits the data to the servlet running on the Domino server.

Note: In this scenario, the user can work with the Notes client in parallel with the opened XFDL file in the Viewer. However, the Notes document containing the XFDL file attachment should be closed at all times to avoid save conflicts. Therefore, the Notes document is closed during prepopulation to prevent save conflicts when the form is eventually submitted.

7. On the Domino server, the servlet receives the submitted form.
8. On the Domino server, the servlet extracts the data from the submitted XFDL file and saves the extracted data to the related Notes document on the server replica of the Notes database.
9. Finally, on the Domino server, the servlet re-attaches the XFDL to the Notes document.

There is no further development for this use case. We can use any prepopulation type we have already created. Data extraction always proceeds using the Java API called from the Domino servlet. This use case is a good starting point for the next use case: working with Notes Client and Workplace Forms in a Zero Footprint scenario.

9.11.3 Use case 3.2 - Notes Client using Webform Server

All use cases contained in scenario 2 and use case 3.1 are all about integrating Workplace Forms with the Notes client using the Forms Viewer. Use case 3.2 investigates the flip side of scenario 2 — integrating Workplace Forms with the Notes client *without* using the Forms Viewer. Scenario 3.2 achieves this integration by using the Webform Server.

Figure 9-58 shows (or prepopulation) that we do not need any new functionality (we can use LotusScript or Java API), nor for value extraction (the already tested Domino servlet implementation fits our needs) for the first try.

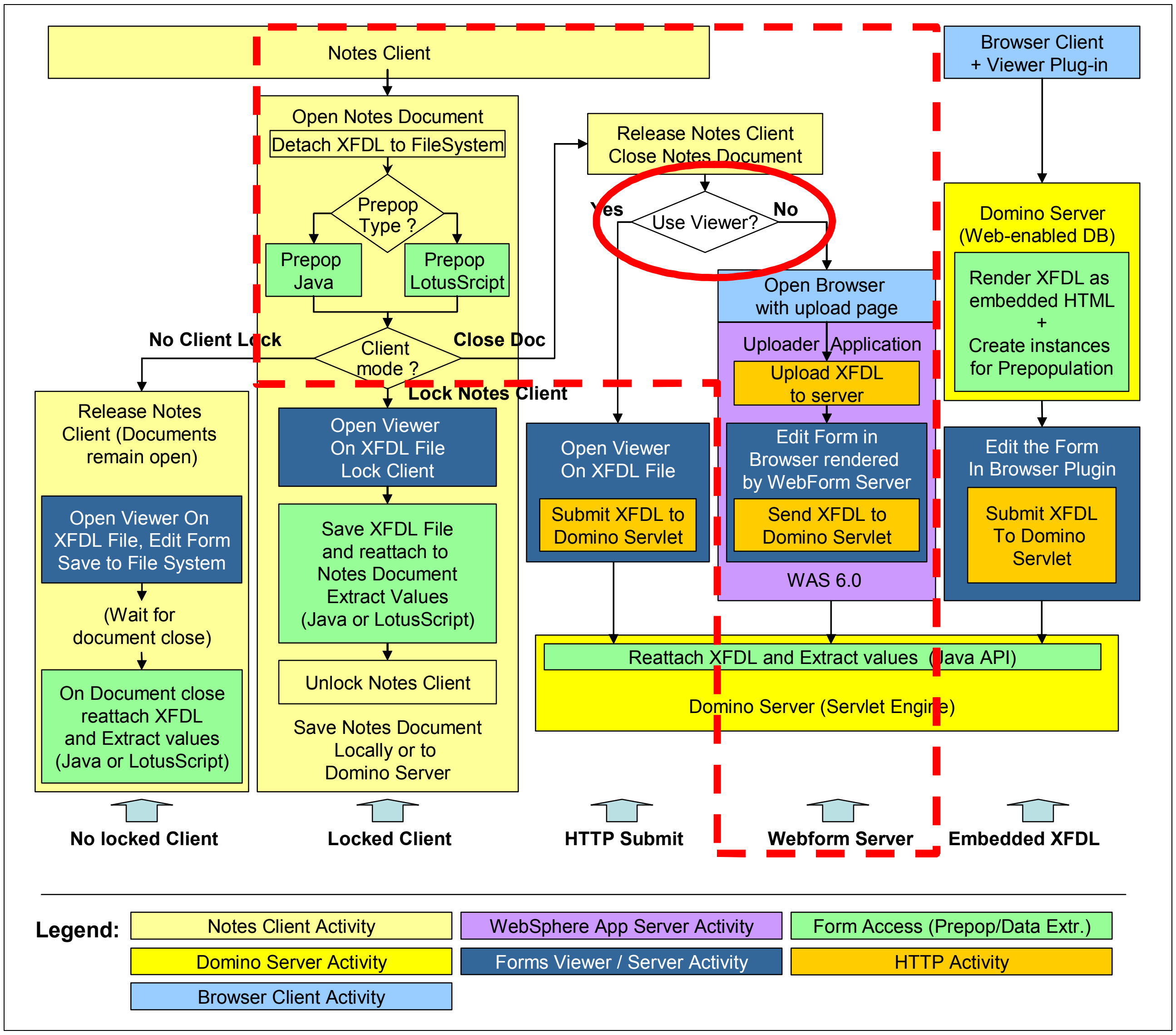

Notes Client
Browser Client + Viewer Plug-in
Open Notes Document
Detach XFDL to FileSystem
Prepop Type ?
Prepop Java
Prepop LotusSrcipt
Release Notes Client
Close Notes Document
Yes
Use Viewer?
No
Domino Server (Web-enabled DB)
Render XFDL as embedded HTML + Create instances for Prepopulation
Open Browser with upload page
Uploader Application
Upload XFDL to server
No Client Lock
Client mode ?
Close Doc
Lock Notes Client
Release Notes Client (Documents remain open)
Open Viewer On XFDL File, Edit Form Save to File System
(Wait for document close)
On Document close reattach XFDL and Extract values (Java or LotusScript)
Open Viewer On XFDL File Lock Client
Save XFDL File and reattach to Notes Document Extract Values (Java or LotusScript)
Unlock Notes Client
Save Notes Document Locally or to Domino Server
Open Viewer On XFDL File
Submit XFDL to Domino Servlet
Edit Form in Browser rendered by WebForm Server
Send XFDL to Domino Servlet
WAS 6.0
Edit the Form In Browser Plugin
Submit XFDL To Domino Servlet
Reattach XFDL and Extract values (Java API)
Domino Server (Servlet Engine)
No locked Client
Locked Client
HTTP Submit
Webform Server
Embedded XFDL
Legend:
Notes Client Activity
WebSphere App Server Activity
Form Access (Prepop/Data Extr.)
Domino Server Activity
Forms Viewer / Server Activity
HTTP Activity
Browser Client Activity

Figure 9-58 Domino environment use case overview - building scenario 3.2 (Notes Client with HTTP submission of the form)

The highlight in this use case is to make the Webform Server render the file that we have stored on the local file system. The idea here is simple: we have to upload the locally stored file to an application that interacts with the Webform Server. The following steps describe this in more detail. The application should process the following steps:

1. Detach the XFDL file and perform the prepopulation on the detached file (using LotusScript, because we would not have access to the Forms Java API in this scenario).
2. Launch a Web browser with a URL pointing to a special HTML page on a Web server that can run the Webform Server servlet extension (WAS, Tomcat, and so on), passing the path of the locally detached XFDL file. The HTML page does an automatic upload of the local XFDL file and passes it to the Webform Server. (This may sound easy, but this is the most complicated step of the solution.)
3. The Webform Server renders HTML for the XFDL file and passes it back to the browser.
4. The submission can be done using the HTTP submission (as in, the HTTPsSubmit use cases in scenario 2) or by using the Save button in the browser.

The differences from scenario 3.1 using HTTP submissions on the Domino side are minimal. In place of launching the Forms Viewer with the file path as the parameter, we launch the browser with a URL containing the upload page and the file path (to the prepopulated XFDL file residing locally) as a parameter. As a subtask, we have to find the browser that needs to be launched.

The difference from the server side is significant. We must design a Web application based on a servlet extending the IBMWorkplaceFormsServerServlet to support Webform Server and at least one special HTTP page or servlet to initiate file upload.

An example implementation can be downloaded from Appendix D, “Additional material” on page 693. An ear file (WebformServerUploadEAR.EAR) is provided as an initial solution that works with Internet Explorer only (because it uses ActiveX® objects to read the file and submit it).

All development for extending the created environment for the new use case is about these three topics:

- Create an upload functionality that works without user interaction. We call it *silent upload*. This upload process runs just after we have finished the XFDL form prepopulation part.
- Create a Web application that is able to pick up the upload and interact with the Webform Server.
- Start a browser on the end user’s desktop that creates an HTTP session with the created application to utilize the provided XFDL rendering service (automatic XFDL upload + rendering for the browser client).

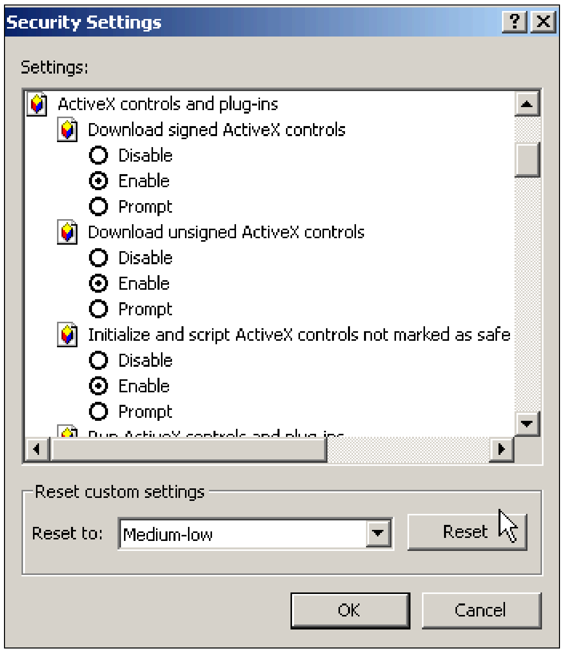
To use the Webform Server, we need to access it on the client side with a compliant browser. Furthermore, the showed upload facility requires MSIE 6.x or 7 to run on the client as the preferred browser. To interact with the Webform Server, we need to create a servlet extending the IBMWorkplaceFormsServerServlet class coming with the Webform Server installation. Since the JVM coming with the Domino server cannot run the IBMWorkplaceFormsServerServlet extension, we have to write a Web application for WAS 5.1 or WAS6.x. This makes up new requirements to our environment.

Client installation requirements for Zero Footprint use case

The following steps illustrate what needs to be done to set up a client machine for the various implementations of scenario 3.2:

1. Install Lotus Notes on the client machine (either Version 6.x or 7.x).

2. Install MS Internet Explorer Version 6.x or 7 on your desktop.
3. Register the servlet submission URL in the browser as *local intranet*.
4. Allow for local intranet to run ActiveX controls in the browser, as shown in Figure 9-59.


Security Settings
Settings:
ActiveX controls and plug-ins
Download signed ActiveX controls
Disable
Enable
Prompt
Download unsigned ActiveX controls
Disable
Enable
Prompt
Initialize and script ActiveX controls not marked as safe
Disable
Enable
Prompt
Reset custom settings
Reset to:
Medium-low
Reset
OK
Cancel

Download signed ActiveX controls: Disable [✓ Enable] Prompt
Download unsigned ActiveX controls: Disable [✓ Enable] Prompt
Initialize and script ActiveX controls not marked as safe: Disable [✓ Enable] Prompt
Reset to: Medium-low

Figure 9-59 Configuration settings in MS IE for local intranet

Server installation requirements for Zero Footprint use case

The following server installations are required to develop and configure this use case:

1. Install Domino Server Version 6.x or 7.x on the server machine.
2. Activate HTTP and the Domino Servlet Engine on the server machine.
3. Install the Workplace Forms API Version 2.6.1 (which is included in the IBM Workplace Forms Server installation package), as recommended in the product documentation, on the server machine.
4. Make the Forms API available for the Domino Server JVM.
   - Copy the jar files from the Workplace Forms API to the <DominoServerProgramDir>\jvm\lib\ext directory, where <NotesProgramDir> is the directory where the Domino Server in installed. This ensures that Domino will find the files. The jar files that should be copied are:
     - pw_api.jar
     - uiw_api.jar
     - pw_api_native.jar
     - uiw_api_native.jar

     OR
   - Ensure that the notes.ini file contains the following entry:

```
JavaUserClasses=c:\WIN2K\system32\PureEdge\70\java\classes\pe_api.jar;c:\WIN
2K\system32\PureEdge\70\java\classes\uwi_api.jar;.
```

5. Copy the Notes database to the server.

6. Open the database and go to the Parameter view. Adjust the parameters for the server URL and submission URL to your environment. (The server name should reflect the name of the current server. All other settings can stay unchanged. Double-check the path to the Notes database.)
7. Create a new parameter document (if not already present) to configure the launch URL for the file upload facility. The parameter name is URLActiveXUploadPage. The parameter value is:

   ```
   http://<yourWASserver>:<yourWASport>/WebFormServerUpload/FileUploadActixeX.html
   ?uploadtype=string&localfilename=
   ```
8. Install the submission servlet on the server. The servlet receives HTTP post submissions from the Viewer and does the necessary data extractions. Place the servlet class file in the <DominoDataRoot>/Domino/Servlet directory.
9. Place the servlets.properties file in the <DominoDataRoot> directory. Both the servlet class file and the servlets.properties file can be downloaded from Appendix D, "Additional material" on page 693.
10. Edit the servlets.properties file to match your environment. Replace the text in bold format in Example 9-42 using the parameters applicable to your environment.
11. Restart the HTTP task on the Domino server.
12. Install a WAS6 server (you need WAS before you can install WebForms). To avoid problems, take care to use installation paths not containing spaces or other special characters.
13. Install IBM Workplace Forms Webform Server according to the Webform Server Administration Manual. To avoid problems, take care to use installation paths not containing spaces or other special characters.
14. Deploy the supporting application (after you have created it, as shown in this chapter) on a WAS6 server instance (for example, server1). Configure the application to work with the Webform Server according to the Webform Server Administration Manual:
    a. Adjust the url/ports to Webform Server (default values are localhost port 8085).
    b. Make the used Forms API and Webform Server Framework libraries (pe_api.jar, uwi_api.jar, jog4j.jar, ws_common.jar, ws_framework.jar) available to the application by doing one of the following?
       - Copying the files into lib/ext folder of the application server.
       - Administering the classpath extensions using variables in the WAS administration console. Create an environment variable called {WFS_FMK_LIB} pointing to the ../redist directory in the Webform Server installation path. Using the WAS admin console, edit the shared libraries definition for WFS_API_LIB and add the lines shown in Example 9-41.

Example 9-41 Add to WFS_API_LIB

```
{WFS_FMK_LIB}/log4j.jar
{WFS_FMK_LIB}/ws_common.jar
{WFS_FMK_LIB}/ws_framework.jar
(similar variables and Shared Library definitions for pe_api.jar and uwi_api.jar)
```

    c. Restart the WAS server.

Example 9-42 Settings in servlet-properties file on Domino server

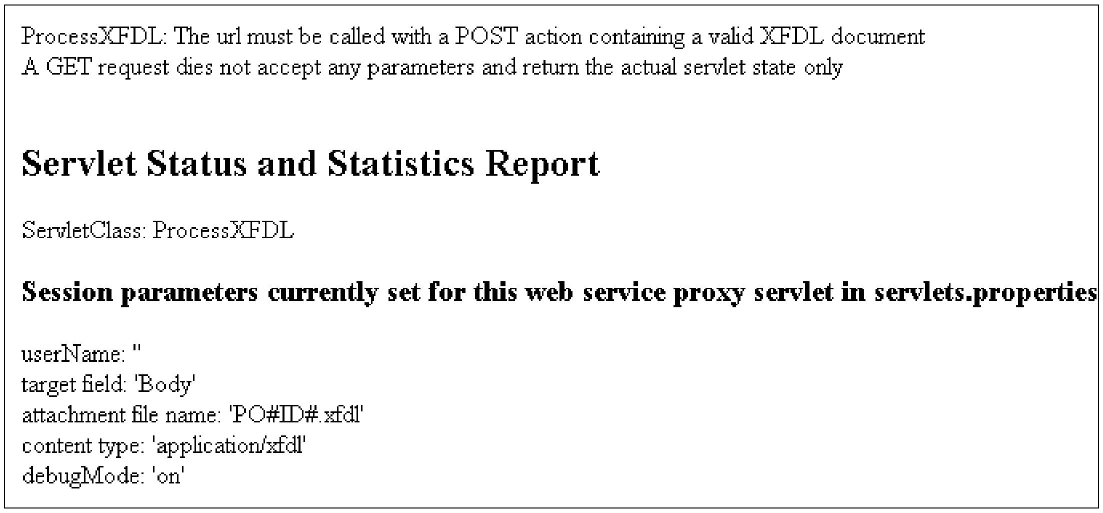
```
servlet.XFDLServlet.initArgs ORBServer=localhost,\
          userName=,\
```

```
password=,\
targetField=Body,\
fileName=PO#ID#.xfdl,\
contentType=application/xfdl,\
deleteReqDocs=0,\
debugMode=on,\
respMessageType=html
```

15. Restart the Domino server and make sure that the HTTP and servlet engines are running.
16. To test that the server setup is correct, enter the following URL on a browser on a client machine:

    `http://<yourserver>/servlet/XFDLServlet`

    The page shown in Figure 9-60 should appear.



ProcessXFDL: The url must be called with a POST action containing a valid XFDL document
A GET request dies not accept any parameters and return the actual servlet state only

Servlet Status and Statistics Report

ServletClass: ProcessXFDL

Session parameters currently set for this web service proxy servlet in servlets.properties

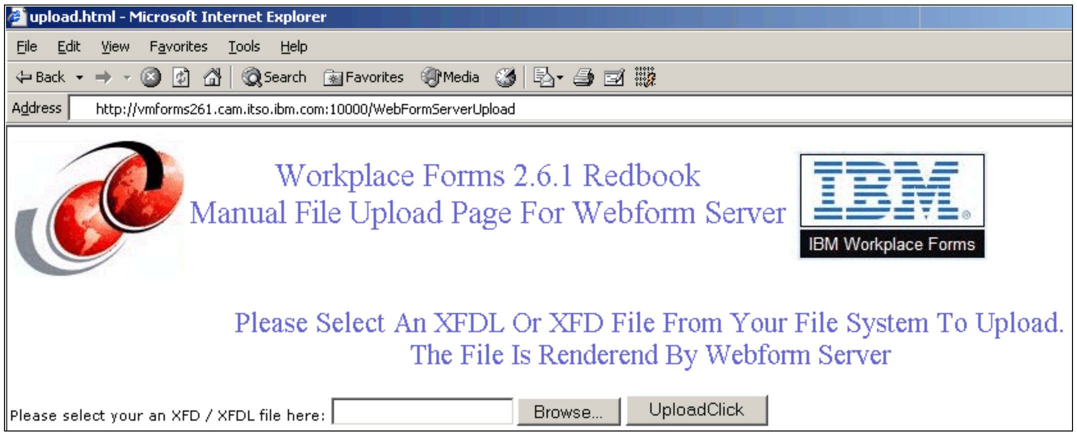
userName: ''
target field: 'Body'
attachment file name: 'PO#ID#.xfdl'
content type: 'application/xfdl'
debugMode: 'on'

Figure 9-60 XFDLServlet welcome page on Domino Server

17. To test the servlet, open any of the existing QuotationRequest documents in the Notes database (or create a new request from the available template), launch the XFDL form using the edit button for use case 3.1, complete the form, and submit it using the submit button in the form. Look at the server log. There should be no errors listed in the log file.
18. Install the Webform Server supporting application to the WAS server (WebFormServerUploadEAR.ear file). Start the application in the WAS admin console.
19. To test the installation, open a browser and launch the following URL:

    `http://vmforms261.cam.itso.ibm.com:10000/WebFormServerUpload`

20. The screen shown in Figure 9-61 should appear.


upload.html - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://vmforms261.cam.itso.ibm.com:10000/WebFormServerUpload
IBM Workplace Forms
Browse...
UploadClick

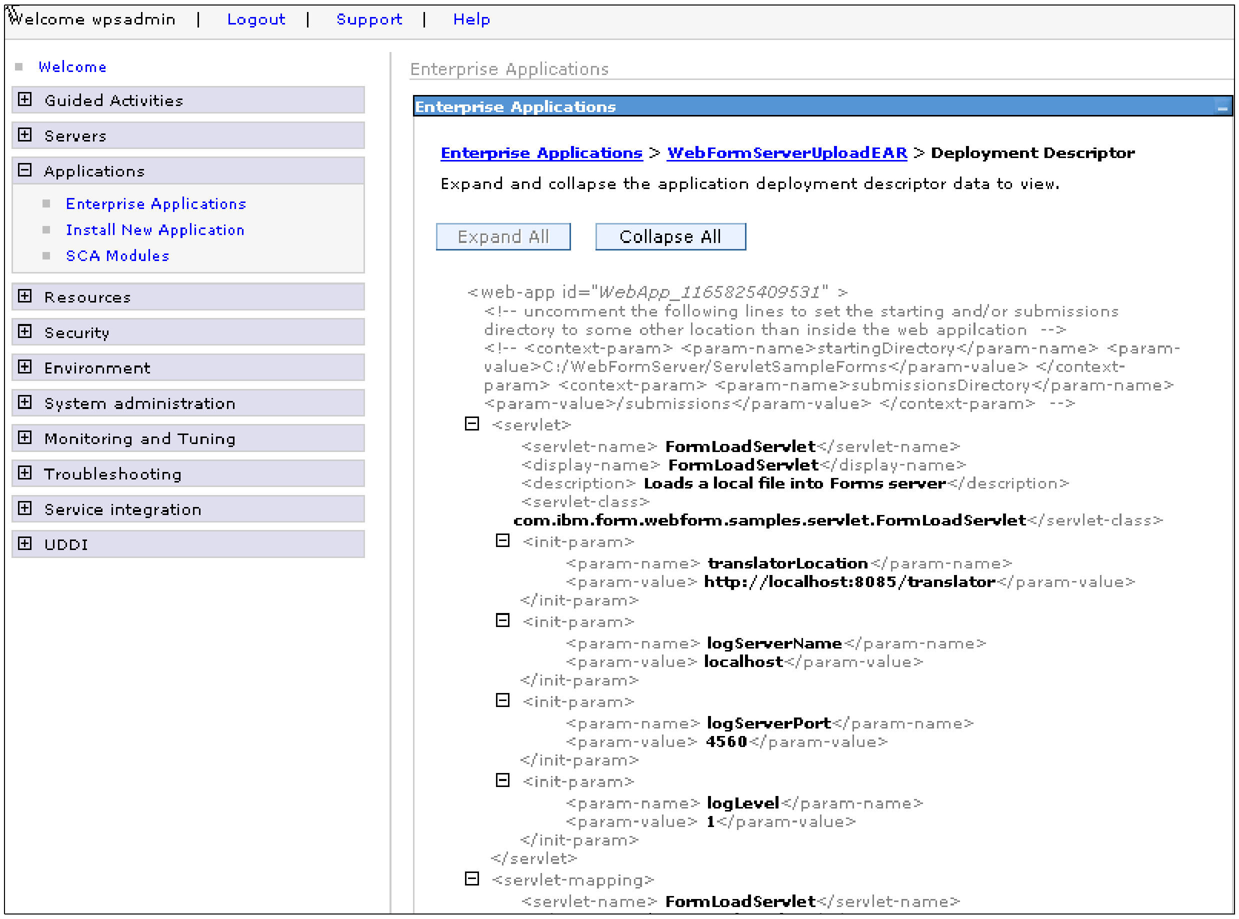
Workplace Forms 2.6.1 Redbook
Manual File Upload Page For Webform Server

Please Select An XFDL Or XFD File From Your File System To Upload.
The File Is Renderend By Webform Server

Please select your an XFD / XFDL file here:

Figure 9-61 Manual upload page in the WebformServerUpload application

21. Select an XFDL file from your local drive and select the **UploadClick** button. The file should be uploaded and rendered by the Webform Server. If this does not work, check that the Webform Server is running. Next check the Webform Server configuration settings in the installed application. Adjust the URL or port for the Webform Server using the WAS admin console, as shown in Figure 9-62.



Enterprise Applications > WebFormServerUploadEAR > Deployment Descriptor

Expand and collapse the application deployment descriptor data to view.

```
<web-app id="WebApp_1165825409531" >
  <!-- uncomment the following lines to set the starting and/or submissions
  directory to some other location than inside the web applcation  -->
  <!-- <context-param> <param-name>startingDirectory</param-name> <param-
  value>C:/WebFormServer/ServletSampleForms</param-value> </context-
  param> <context-param> <param-name>submissionsDirectory</param-name>
  <param-value>/submissions</param-value> </context-param>  -->
⊟ <servlet>
      <servlet-name> FormLoadServlet</servlet-name>
      <display-name> FormLoadServlet</display-name>
      <description> Loads a local file into Forms server</description>
      <servlet-class>
     com.ibm.form.webform.samples.servlet.FormLoadServlet</servlet-class>
  ⊟ <init-param>
          <param-name> translatorLocation</param-name>
          <param-value> http://localhost:8085/translator</param-value>
      </init-param>
  ⊟ <init-param>
          <param-name> logServerName</param-name>
          <param-value> localhost</param-value>
      </init-param>
  ⊟ <init-param>
          <param-name> logServerPort</param-name>
          <param-value> 4560</param-value>
      </init-param>
  ⊟ <init-param>
          <param-name> logLevel</param-name>
          <param-value> 1</param-value>
      </init-param>
  </servlet>
⊟ <servlet-mapping>
      <servlet-name> FormLoadServlet</servlet-name>
```

Figure 9-62 Webform server related entries stored for the WebformServerUpload Web application

Before beginning the development, let us review the XFDL form life cycle in the scenario. All of the following steps in the outline (Figure 9-63) are handled by the code behind the Edit Attachment - Use case 3.2 button that we create, unless otherwise indicated.

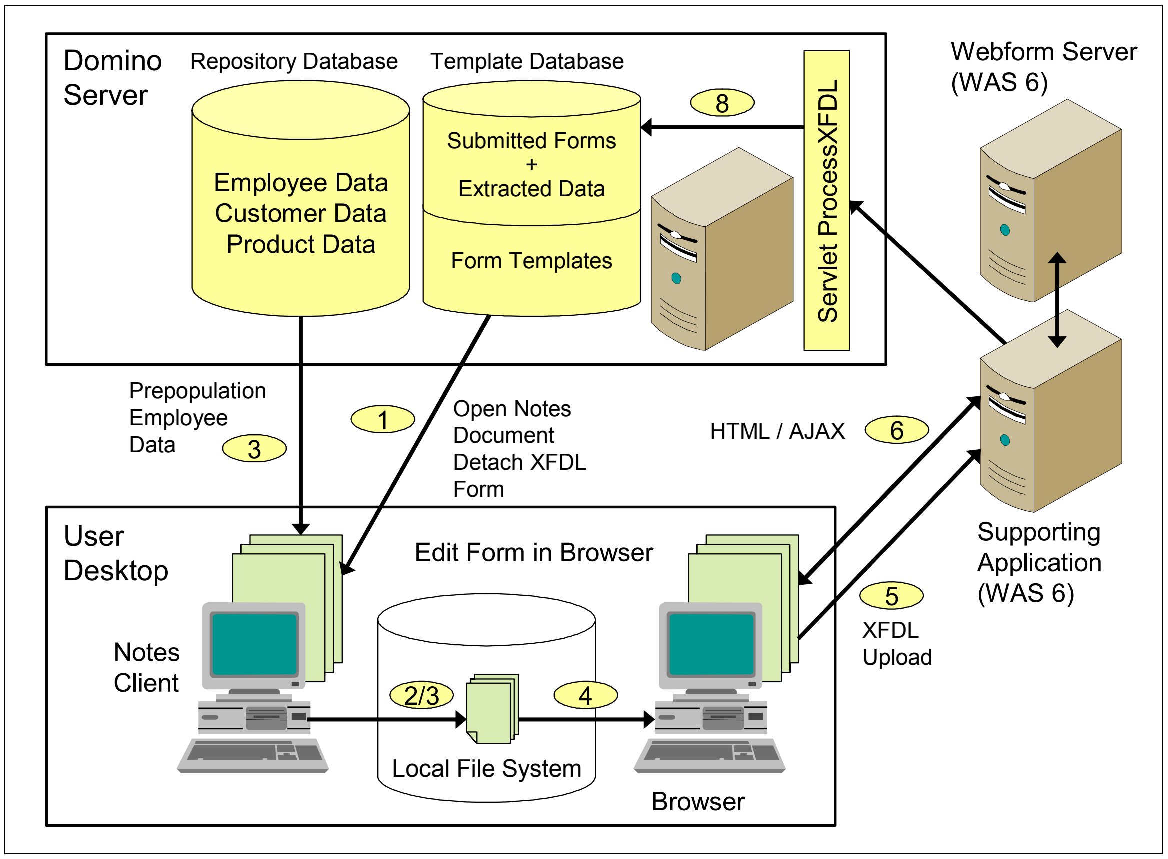


Figure 9-63 High-level XFDL form life cycle in Notes Client/Webform Server integration use case

Figure 9-63 shows the following steps in a XDFL editing cycle:

1. The user opens a Notes document and clicks the **Edit Attachment - Use case 3.2** button to edit an XFDL attachment.
2. Client code - The attached XFDL file is detached to a temp directory on the client machine.
3. Client code - The prepopulation of the detached XDFL file is performed using LotusScript text parsing. Data is read from the resource database. In this scenario, the Notes document is closed immediately, the Notes client is not locked, and the servlet can update the document on the server when the form gets submitted.

   Client code - The installation path of the browser is detected using a temporary HTML file.
4. Client code - The browser (Microsoft Internet Explorer) is launched with an URL pointing to a special upload page coming from a supporting Web application.
5. Browser code - The JavaScript in the launched HTML page initiates an automatic upload of the XFDL file. The servlet inside the supporting Web application requests an HTML rendering from the Webform Server and sends the response back to the browser.
6. The user can now edit the XFDL file in the browser. AJAX messages keep the browser content and the XFDL model in the Webform Server consistent. In this scenario, to save the XFDL file, use the **Submit** button to save the changes. The Submit button submits an

AJAX request to the Webform Server to return the completed XFDL file. The servlet in the supporting Web application gets hold of the form.

Any XForms submissions activated while doing edits in the form are executed by the Webform Server. They retrieve the data from the Domino server, update the internal XForms Model, and send any updated information back to the browser using AJAX. (XForms submissions are not designed in Figure 9-63 on page 618 to keep it simple.)

7. Receiving the form from the Webform Server, the servlet sends the XFDL file to the URL stored initially in the received XFDL form. This URL points to the ProcessXFDL servlet on the Domino server.
8. The ProcessXFDL servlet on the Domino server extracts the data from the XFDL stream and stores the entire XFDL file back to the template database as a new or updated QuotationRequest.
9. The response generated by the Domino servlet is sent back to the supporting application, which in turn returns it to the browser client. (This step is not visible in Figure 9-63 on page 618.)

Note: In this scenario, the user can work with the Notes client in parallel with the opened XFDL file in the browser. However, the Notes document containing the XFDL file attachment should be closed at all times to avoid save conflicts. Therefore, the Notes document is closed during prepopulation to prevent save conflicts when the form is eventually submitted.

Let us now create/inspect the code for this solution.

Use case 3.2 - Domino development

Domino development for this use case is limited to the creation of new code fragments related to the new decision point branching to the browser launch for file upload.

This is done in the LotusScript library function LibFormsIntegration, function file_detachAndEdit, as shown in Example 9-43.

Example 9-43 New code in function file_detachAndEdit to launch the browser

```
   ......
   ' detach the file to the WorkDirectory
   dummy& = file_detachXFDLByName ( InItem , AttName ,WorkDir ,  True, doc )
   file_detachAndEdit  = os_FileLastModified ( WorkDir, AttName ) 'Read the File's
LastModifiedDate and store it for further use

   '################## forms - do prepop #################
   If prepopType <> ""  Then Call forms_prepop(WorkDir, AttName, prepopType, doc)

   'here we evaluate the useServer parameter from the initiation
   If useServer Then
        'create a url to upload the attachment by a special html page
        'So we call an upload page with the IE now
        'create here an URL parameter to send the local file path to the
        'supporting web application
     urlpath = Join(Split(WorkDir + pathSep+AttName, "\"),"/")
     urlpath = Join(Split(urlpath, " "),"+")
     urlPath = utils_getParamT("URLActiveXUploadPage", session.currentdatabase) _
        & urlPath & "&dummy=" & Format(Now,"YYYYMMDDHHNNSS")
```

```
      'create a dummy html file to get the default browser path
      Call utils_createHTMLFile(WorkDir, "launchPage.html")
      ExeFile = os_FindExecutableByExtension ( WorkDir, "launchPage.html" )
      Kill WorkDir   & pathSep & "launchPage.html"

      'now w can call the browser with the url
      'Messagebox urlPath
      result = Shell ( Cstr ( ExeFile ) & " """ & urlPath  & """", 1) '// Launch
the file with the associated application
   Else
.................
'here goes the code for the other use cases
................
   End If
ex:
   Exit Function
errorhandler:
   Messagebox "Error: " & Err() & " in " & Lsi_info(2) & " line " & Erl()
   Messagebox Error$
   Resume ex

End Function


Sub utils_createHTMLFile(WorkDir, AttName)
   'create a temp html file just to utilize the determination of the default
browser on the client maschine
   On Error Goto Errorhandler
   Dim fileNum As Integer
   Dim FullPath As String
   FullPath = WorkDir   & pathSep & AttName
   fileNum% = Freefile()
   Open FullPath For Output As fileNum%
   Write #filenum%, "<HTML></HTML>"
   Close  #filenum%

ex:
   Exit Sub
Errorhandler:
   Messagebox "Error " & Err() & " in " & Lsi_info(2) & " at line " & Erl() &
Chr$(10) & Error$
   Resume ex
End Sub
```

The provided code launches the browser (MSIE must be the default browser in the system) with a URL like this:

```
http://vmforms261.cam.itso.ibm.com:10000/WebFormServerUpload/FileUploadActixeX.
html?uploadtype=string&localfilename=c:/temp/Redbook261_V03.1.xfdl&dummy=200612160
01342
```

The URL consists of the parts listed in Table 9-13.

Table 9-13 URL structure for the initiation of the file upload

URL part	Comment
`http://vmforms261.cam.itso.ibm.com:10000`	URL pointing to the server
`/WebFormServerUpload`	Path to the Web application (content root)
`/FileUploadActixeX.html`	Name of the upload page to call
`uploadtype=string`	Parameter differentiating between a manual upload (that comes as mime type) and the automatic (silent) upload that is posted as string
`localfilename=c:/temp/Redbook261_V03.1.xfdl`	File path on the local file system to the xfdl form to upload
`&dummy=20061216001342`	Parameter containing a random number to prevent caching

That is almost the entire development for the Domino part. We create an initiation button for the template form and one for the quotation request form with the code shown in Example 9-44.

Example 9-44 Initiation buttons Zero Footprint access to the XFDL form

```
'******* code for the Template form *********************

   Dim useServer as boolean
   isFirstOpen = True  'evaluate all prepopulation settings for first open
   useServer = true
   prepopType = "LotusScript"
   Dim newDoc As NotesDocument
   Set newDoc =  client_NewFromTemplate()
   Call client_openXFDLForm("Body", prepopType,  "close", useServer, newDoc)

'******* code for the Template form *********************

   Dim useServer as boolean
   isFirstOpen = False 'skip all on first open only prepops
   useServer = true
   prepopType = "LotusScript"
   Call client_openXFDLForm("Body", prepopType,  "close", useServer, Nothing)
```

Restriction: Remember to use the prepopType *LotusScript*. The prepopType *API* works in your development environment, but not on the end-user clients without Forms Viewer and API.

Attention: Before testing, make sure that the parameter document for the file upload URL points exactly to your supporting application (see the deployment instructions for this use case).

Use case 3.2 - J2EE development

As the final part of the development, we develop the Web application uploading the file from the file system and managing the browser interaction with the Webform Server. This application consists of the upload page and a servlet for the Webform Server handling.

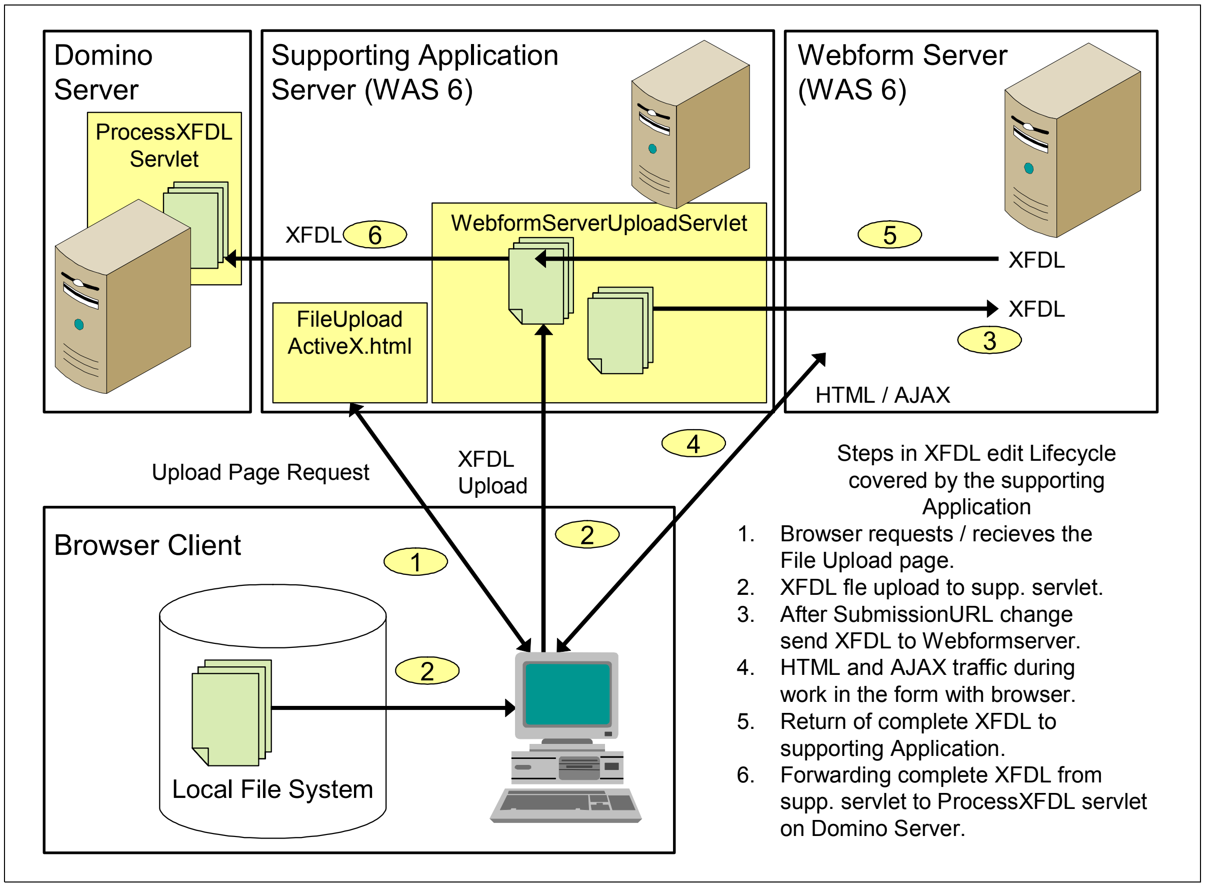

Domino Server
ProcessXFDL Servlet
Supporting Application Server (WAS 6)
WebformServerUploadServlet
FileUpload ActiveX.html
Webform Server (WAS 6)
XFDL
6
5
XFDL
XFDL
3
HTML / AJAX
4
Upload Page Request
XFDL Upload
2
1
Browser Client
2
Local File System
Steps in XFDL edit Lifecycle covered by the supporting Application
1. Browser requests / recieves the File Upload page.
2. XFDL fle upload to supp. servlet.
3. After SubmissionURL change send XFDL to Webformserver.
4. HTML and AJAX traffic during work in the form with browser.
5. Return of complete XFDL to supporting Application.
6. Forwarding complete XFDL from supp. servlet to ProcessXFDL servlet on Domino Server.

Figure 9-64 Steps in XFDL form editing life cycle covered by the supporting Web application

The servlet to create must implement the following steps in detail:

1. Receive the upload initiated by the upload page.
2. Exchange the submission URL stored in the form (actually pointing to the Domino server based servlet) into a URL pointing to its own. Otherwise, pressing the submit button in the form sends the actual HTML page straight to the Domino servlet, not the complete XFDL file as required.
3. Hand over the prepared page to the Webform Server and wait for the completed form.
4. In the completed XDL form change the URL back to the original state and submit the complete XFDL stream to the Domino submission servlet.

We do not show here the complete code. Instead, we discuss the file handling challenge and the main operation modes for the servlet in the supporting Web application.

File upload/download solution

It is always a security issue to process a silent upload (an upload without any user interaction) from the local file system, because this is commonly treated as a violation of the user's security. Therefore, all relevant browsers disable the HTTP upload control for any external interaction such as setting the local file name or pressing the upload button. This is why we can use the upload control defined in the HTTP specification for manual upload, but not for application controlled file transfer. There are many ways to overcome this, but there seems to be no way to do this without user interaction or reducing browser security settings. Three possible solutions are:

- Using MS ActiveX controls as we do in this book (works only in MSIE and requires lowering the security settings)
- Creating special upload applets (work in different browsers, but require special security settings as well)
- Using inline Java code in JavaScript (in Mozilla browser)

In this book we stick with the implementation of the ActiveX usage due to the lower development effort.

Attention: For a production use, this topic must be discussed with the customer security and desktop administration. There is probably not one generic solution fitting all situations.

Here is the full code for the current upload page contained in the Web application, as shown in Example 9-45.

Example 9-45 Code for the current upload page

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
<HTML>
   <HEAD>
      <META http-equiv="Content-Type" content="text/html; charset=ISO-8859-1">
      <META name="GENERATOR" content="IBM Software Development Platform">
      <META http-equiv="Content-Style-Type" content="text/css">
      <LINK href="theme/Master.css" rel="stylesheet" type="text/css">
      <TITLE>FileUploadActixeX.html</TITLE>
      <SCRIPT language=JavaScript>

var ServletUrl = "";
//read the request params
//read the file from file system (allow ActiveX in your browser)
//submit it
function submitFile(){
 var filepath = getURLParam('localfilename');
 var fso, str, ForReading;
 if (filepath == null) return;
 if (filepath == '') return;
 //alert(filepath);
 ForReading = 1;
 fso = new ActiveXObject("Scripting.FileSystemObject");
 //This works for textfiles only!! - not for binaries!!
 file = fso.OpenTextFile(filepath, ForReading, false);
 str = file.ReadAll();
 file.Close();
// alert(str);
ServletUrl  = 'FormLoadServlet?localfilename='+filepath+
'&mode=html&uploadtype=string'
 return submit( ServletUrl, str);
}

function submit(strUrl, strXFDL) {
```

```
//objHTTP = new ActiveXObject("Microsoft.XMLHTTP");

   if (document.implementation.createDocument)
   {
        objHTTP = new XMLHttpRequest();
        objHTTP.open("POST", strUrl, false);
   }
   else if (window.ActiveXObject)
   {
        objHTTP = new ActiveXObject("Microsoft.XMLHTTP");
        objHTTP.open("POST", strUrl, false, "", "");
   }

   if (objHTTP) {
      objHTTP.setRequestHeader("Content-type", "multipart/form-data;
charset=UTF-8");
      objHTTP.setRequestHeader("Content-Disposition", "form-data");
      objHTTP.setRequestHeader("Content-Length", strXFDL.length);
      //alert(strXFDL.length);

      objHTTP.send(strXFDL);
      resp = objHTTP.responseText;

      objHTTP = null;
      return resp;
   } else {
      alert("could not create HTTPObject.\n This implementation of an automatic
file upload uses ActiveX and works in MS IE Browser only.");
      return "";
   }
}

function getURLParam(strParamName){
  var strReturn = "";
  var strHref = window.location.href;
  if ( strHref.indexOf("?") > -1 ){
    var strQueryString = strHref.substr(strHref.indexOf("?")).toLowerCase();
    var aQueryString = strQueryString.split("&");
    for ( var iParam = 0; iParam < aQueryString.length; iParam++ ){
      if (aQueryString[iParam].indexOf(strParamName + "=") > -1 ){
        var aParam = aQueryString[iParam].split("=");
        strReturn = aParam[1];
        break;
      }
    }
  }
  return strReturn;
}
      </SCRIPT>
   </HEAD>
   <BODY>
      <SCRIPT language=JavaScript>
      if (! document.all){alert("This implementation of an automatic file upload
uses ActiveX and works in MS IE Browser only.");}
      var ret = submitFile();
      if (ret){
         if (ret.indexOf("EXCEPTION = Connection refused: connect") > 0)
            { alert ("No connection to Webform server! \n make sure the server is
running")}
         else if (ret.indexOf("Webform Server Framework Error") > 0)
            { alert ("Errors occured while loading/rendering the form!\nCheck form
design or Webform server installation issues.")}
         }
      document.close();
      // we are ging to replace the upload page with the first page coming from
the application
      // this would be the browser detection page created by webform server
      document.open("text/html", "replace") ;
      window.document.write(ret.split("</").join("<\/"));

      </SCRIPT>
   </BODY>
</HTML>
```

The JavaScript function submitFile() — activated just after the page is loaded — reads the filepath to the locally stored XFDL file from the URL parameters, gets the file from file system, posts it to the supporting application, and receives back an answer from the supporting application. This is — if any errors occur — the first rendered HTML page coming from the Webform Server. To display it, the JavaScript function document.write(renderedHtmlFromXfdl) replaces the current HTML page with the received content.

If we receive an error, the JavaScript adds to the most common error messages (no connection, rendering error) some instructions to solve the problem.

This is our solution for file upload.

Another point to discuss here is the way we submit the completed page. We do not try to create a special file download facility to store the completed page locally on the client. This should be possible too using a functionality similar to file upload (ActiveX or a custom applet). In any case, the Save button in the Webform Server toolbelt cannot be used for a silent download, because it prompts the user for a directory to store the file. The easiest (no cost) solution is to use the already implemented Domino servlet. This seems to be a valid solution, since the user must be online anyway to use the Webform Server. A local download solution should be considered for production use, since this would minimize the risk of replication conflicts due to parallel updates by the user in local replicas and by the servlet on server and allow for doing any updates to the application as data extraction and form storage in the Notes user security context.

Configuration of the supporting servlet

The supporting Web application contains a single servlet extending IBMWorkplaceFormsServerServlet (as required for the Webform Server support). It is designed to support all necessary activities. The operation mode for each request is controlled by specific URL parameters, while the data stream (containing the XFDL form in the actual version) is always sent as POST data.

Table 9-14 gives an overview of the operation modes and the related URL parameters.

Table 9-14 Overview of URL parameters and operation modes

URL parameters	Operation mode
uploadtype=mime&localfilename=xxxxxxx or localfilename=xxxxxxx (no uploadtype parameter set)	Upload from the local file system as mime type. This processes uploads coming from an HTTP file upload control for manual used in page FileUpload.html. The XFDL file is uploaded and sent to the Webform Server. Webform Server renders the HTML for the browser client and sends it back to the browser.
uploadtype=string&localfilename=xxxxxxx	Upload from the local file system as XML string. This processes automatic uploads coming from the silent upload page FileUploadActiveX.html. The XFDL file is uploaded, submission URLs are changed, and the complete XFDL file is sent to the Webform Server. The Webform Server renders the HTML for the browser client and sends it back to the browser. This URL is configured in prepopulation reading the value for parameter URLActiveXUploadPage stored in the template database.
uploadtype= submission	The Webform Server returns a completed XFDL file. This occurs when the user clicks a button of the type Submit or Done in the browser. The servlet puts the original submission URL back to the form, submits it to the Domino servlet, and waits for the response. This response is forwarded to the browser client. The Domino servlet should return a success or an error page.

For details, see Appendix D, “Additional material” on page 693.

9.12 Domino Forms Integration - solution considerations

After creating the use cases discussed previously and exploring even more techniques to integrate with Domino that are not shown here, it is time to discuss considerations at a somewhat higher level.

What are the circumstances to consider before or while building solutions for Domino/Forms integration? We discuss each circumstance in detail.

9.12.1 Document handling in the Domino application

Integration with the Notes client tends to be difficult when we try to keep the XFDL file and the updated information within the Notes document that is currently opened by the user. It is a better idea to store the XFDL file and the extracted data in another document rather than the one that is currently opened in the Notes client. This reduces the code complexity and the risk of save conflicts. An idea is to store the updated XFDL file and the extracted data in a response document or in relational databases.

9.12.2 Language considerations (LotusScript versus Java versus LS2J)

Using LotusScript to access the XFDL file is appropriate only in simple use cases, or in Zero Footprint scenarios, as discussed in 9.11, "Scenario 3 - Domino integration using HTTP submissions for completed forms" on page 606, and is limited in functionality (no signature check, no compressed forms). Having the Forms Viewer installed, it is a better choice to use the Workplace Forms Java API and access the form using the Java API wherever possible.

Using LS2J does not provide significant gains in comparison to using Java agents, but has serious disadvantages when accessing Domino/Notes documents: no offline work, Domino Internet Inter-ORB Protocol (DIIOP) is required on the Domino server, password for a highly permitted user handled on the Notes client, and so on.

Among all of the use cases we have covered, there may be one single case where the use of LS2J is reasonable — that is, when we are using Java code and we do not access Domino data (for example, checking signatures only or compressing/decompressing the form, when the Forms API is not installed).

Using Java agents that call the Workplace Forms Java API seems to be the best choice for prepopulation and value extraction when the values have to be stored in Domino.

In environments with no Forms Viewer/Forms API installed on the clients, it can be a good idea to use Java Agents or LS2J to change the compression mode of the files. In use case 3.2, it is desirable to use Java for prepopulation, even if we do not have access to the Forms Java API. The reason is that we can use publicly available Java libraries to encode/decode base-64-gzip encoded (compressed) XFDL files. This would be very hard (and slow) to do in LotusScript. We do not provide an example for this use case, but there should be no problems developing this, based on the Java agent samples and the provided WFServer sample.

Another technique is to use server-based Java background agents that perform prepopulation using the Forms API. This use case is not covered in this book.

9.12.3 Notes client behavior (locked versus unlocked client)

The technique used to release the Notes client and ask on document close to re-attach the form (scenarios 2.2 and 2.3) provides a significantly better user experience than the technique of using a locked Notes client (scenario 2.1). Nevertheless, locking the Notes client is the more robust and secure solution. The correct choice depends upon the given priorities and in the average available end-user skills in handling attachments. Low end-user skills tend to suggest to select the most secure choice.

Consider the situation where you are to complete a form, but you need additional information from your mail file or calendar to do so. In this scenario, a released client has a significant advantage over a locked client.

It seems to be difficult to track more than one opened attachment per Notes document if the Notes client is not prevented from editing more than one of the attachments at a time. However, this should not be a big issue in a Forms application. This can be circumvented by stipulating in the business rules of the application that there is one XFDL file per Notes document.

9.12.4 Application-side validation after form submission

In production environments it is often necessary to process some server-side validation on submitted forms that are not included for any reason inside the XFDL form. When this validation detects any error in the submitted page, it is necessary to force the end user to correct the problem. For the different use cases, we can turn out completely different consequences for the application development. Let us go through all of the build scenarios.

Forms Viewer, local data extraction

In our scenarios that have the Viewer installed and no HTTP submit (scenario 2, use cases 2.1, 2.2, and 2.3), it is possible to store the XFDL file, even if there are validation errors. The Viewer allows us to do so. After the file is completed, it is always stored back to the Notes database. The data extraction routine should first do a validation check and return the file to the end user if any errors occur (or at least prevent the user from routing the document to the next activity in the workflow). This behavior can be changed in the global form properties. Storing incomplete filled forms might sometimes be considered a drawback, but this is exactly what is required in some use cases. Be aware of the different default settings in the form for storing/submitting incomplete forms, and adjust the defaults to your needs.

If the submission must be valid and there are errors in the form, the user is not prevented from re-opening the form once more in the Viewer and correcting the errors. In all scenarios that do not use HTTP submissions, this can be done by running the detach/edit/attach cycle as many times as necessary.

Forms Viewer, HTTP submission/server-side data extraction

Using the Viewer and HTTP submission (use case 3.1), the situation is completely different. The end user can only submit completely valid forms, by default. Setting the option submitwithformaterrors to permit or warn will allow draft submissions. However, if there are additional validations required, which the end user cannot do before submitting, a problem comes up. If any validation done on the server fails, we cannot return a response from the servlet that would reopen the form in the Viewer as on first open, for two reasons:

- We do not have the current version of the submitted file on the client.
- We can only force the Notes client to open the just submitted form in a browser using the Viewer as a plug-in.

This breaks the initial use case (Notes client + Viewer only; no browser). Reopening the form in the Viewer plug-in can result in annoying pop-ups about a non-supported browser platform.

One possible way to proceed here is to put the submitted document on hold and notify the end user of the detected problems. With a link in the mail or a work basket, the user can reopen the document, edit the form another time, and correct the errors.

Notes Client, Webform Server

For the Zero Footprint scenario with Notes Client (use case 3.2) it is somewhat easier to handle server-side validation checks. In this case, the Domino servlet detects an error after the submission, and the servlet can push back the file to the supporting application. The application can then forward the XFDL to the Webform Server and renew the form editing cycle with the browser client. This seems to be a consistent behavior.

Of course, the solution found for use case 3.1 (no immediate reopening of the form but end user notification with a link to the document) is always a possible way to go.

9.12.5 Automatic file upload

Most browsers do not allow a *silent* file upload. They require the user to enter the path to the uploaded file into the upload control. We cannot use this control for an automatic upload. Workarounds can be made using inline Java code in JavaScript (in Netscape browser), ActiveX (in Microsoft Internet Explorer), or a file upload applet. All these settings require a dedicated browser platform, or at least some changed security settings. In our scenario, we implemented the ActiveX option, which is on the FileUploadActiveX.html page. The provided solution only works with the Internet Explorer browser. Be aware of the security implications of any automated file upload/download activities in the browser and discuss the implications of best solution for the given environment (creating applets, using ActiveX, introducing signing selected controls with a trusted signature, and so on) with the customer security and system administration.

Be aware that there can be other solutions to transferring the XFDL document between the Domino application and the Webform server that might fit your specific requirements:

- Retrieve the XFDL file from the Domino server running an HTTP request from the supporting application against the Domino server.
- Retrieve the XFDL file from the Domino server using Domino DIIOP capabilities from the supporting application.
- Store the XFDL file on a shared temporary (between the Domino server and the WAS server with the supporting application) directory.
- Download the completed XFDL file to the client machine and process value extraction/attachment handling Notes client based as in Domino scenario 2.

9.12.6 Document save in the Webform server environment

Using the Webform Server, the end user can save the XFDL file to the file system by using a custom or the standard save button in the Webform server toolbelt. It is possible to use the original file name for saving, but the user is forced to choose the target directory on the file system in a wizard. This is the reason that saving the XFDL file to the file system using a standard save button is not the best choice for a robust solution. Nevertheless, the user can save the XFDL file locally using the standard save button rendered in the UI (for example, for a private copy or to work on the file later on). If the user wants to open the file later on, he would have to use a Forms Viewer. If the viewer is not available, he could use the Webform Server toolbelt page, which exposes a button for local file download. This page is a not customizable component of the Webform Server with a lot of other functionality.

To have a customizable solution for the upload of a locally stored XFDL file, the provided supporting Web application contains a special HTML page, FileUpload.html, that presents a normal file upload control. The user has to enter a path, and the page submits the file as a MIME type to the Webform Server. Be aware of this page. It could be the starting point for a customized Forms rendering service in your enterprise.

9.12.7 Character set

Webform Server uses charset UTF-8. The XFDL file in scenario 3 is handled in multiple systems:

- Domino attachment
- File system
- Domino stream
- Domino string (during script access)
- JavaScript (during preparation for file upload)
- Java objects/String, byte []. InputStream, OutputStream

Double check the compliance of all components of the passed characters that push special character combinations around (as part of the form XML, as data, and so on).

Make sure to stay with the UTF-8 character set when designing forms that are potentially used on a WebForm Server.

10

Workplace Forms and WebSphere Portal fundamentals

In this chapter we describe the key concepts associated with using Workplace Forms in conjunction with portal. Topics addressed include:

- Defining *integration* of Workplace Forms and portal
- Key concepts
- Displaying forms In portal
- Workplace Forms sample portlets
- Keeping form submissions in-context
- Inter-portlet communication

10.1 Defining integration of Workplace Forms and portal

As a level-set let us discuss the phrase *integrating Workplace Forms and portal*. People with different backgrounds tend to perceive this differently. It is important to go back to the core concepts of form integration (as discussed in Chapter 4, “Approaches to integrating Workplace Forms” on page 151):

- User interface (UI) integration
- Data integration
- Process/workflow integration
- Security context integration

Most often, when someone brings up “*integrating Forms and portal*, it simply means the use of Workplace Forms from within a portal application (that is, interacting with forms within portlets).

Tip: When discussing integrating Workplace Forms and portal with a technical audience, ensure that the dimensions discussed here and in the Chapter 4, “Approaches to integrating Workplace Forms” on page 151, are understood.

The last category covered in the integration chapter, client-side device/hardware integration, is not impacted by the portalization of a form application, and as such will not be covered.

10.2 Key concepts

Before we discuss the aforementioned categories of integration relating to portal and forms, there are several key points to be aware of.

Important: The Workplace Forms Viewer can be displayed in a portlet independent of the version of portal by embedding it in a JSP (HTML) page. Only use of the Webform Server (Zero Footprint forms) injects dependency for ensuring that a supported level of portal is used.

Important: Workplace Forms Webform Server ships with two example portlets, sometimes referred to as the *Portal framework*. This framework should be extended to implement Zero Footprint Workplace Form portal applications.

Important: The Workplace Forms (Portal Document Manager (PDM) integration is an example implementation of an integration between Workplace Forms and Portal Document Manager. It is not a generic portal integration. Refer to the above-mentioned Portal framework for a generic integration.

User interface (UI) integration

There are two ways to put a Workplace Form on the glass and to keep it in-context of your portal application:

- Workplace Forms Viewer: Embed the Viewer in an HTML page as an object. Return this JSP from within the doView method of your portlet.

- Viewer or Zero Footprint: Extend the Portal framework. From within the doViewEx method, return either the complete XML form or utilize the Webform Server to translate the current page into HTML and Javascript. This is the recommended approach and has a number of advantages, including easing migration from Viewer-only to Zero Footprint and hybrid form deployment (Viewer and Zero Footprint).

Data integration

The choices for data integration are no different than in the case of servlet-based Web applications:

- In portlet: Use the Workplace Forms API to set data into the form or extract data, or use HTML embedding and pass data in at runtime using the parameter options.
- In Viewer: Call Web services from the client side (client-to-Web service calls).

In the upcoming sections we provide several *Hello World*-style code snippets for illustration purposes.

Process/workflow integration

While one can implement workflow in their Web application (servlet or portlet), integration with enterprise-class workflow is often a requirement. IBM Portal Server - Process Server is one example. Although an in-depth analysis of process server and forms integration is beyond the scope of this book, let us touch on the three standard integration patterns:

- Submitting a Workplace Form launches a new instance of a business process.
  - Online, in a browser environment
  - Off-line, with Workplace Forms Viewer (business process initiated upon reconnect)
- A Workplace Form is used to handle a human task in a long-running process.

  To complete the task, your form processing servlet calls the complete() function for the task.
- A form triggers arbitrary calls to Business Flow Manager or Human Task Manager.
  - Use a Web service facade to call Process Choreographer.
  - Embed Web service calls in a form and trigger them based on conditional logic.
  - In this scenario, the form relies on the server-side to process data and determine the state of the form. For example, “Is requested transfer amount less than or equal to account balance?” If so. X. If not, Y.
  - Standard solution architecture practices apply. One should partition logic and functionality in a way that optimizes their system given requirement constraints. For example, the approach of storing all state information and performing all conditional within process server does not make sense when users need to work with a form off-line.

Security context integration

Security context integration is highly dependent on overall solution architecture. If, for example, one builds a solution based on a Domino infrastructure, then this has different implications from building a solution on top of WebSphere Application Server and Tivoli® products.

In general, however, the following are true:

- Workplace Forms are self-contained documents.
- Digital signatures are only one aspect of the overall security picture. Signatures can be used to make a form *tamper evident*, but are not a replacement for encryption.

- Workplace Forms support the use of encryption for transmission (HTTPS). However, they do not provide native file-system encryption. Instead we rely on third-party software or encryption libraries and custom code (Domino, as one example).
- Identifying information such as user ID, role, or privilege level can be embedded into a form.
- Meta data or data payloads can be transported via forms to external systems.
- Workplace Forms can be designed to provide a role or identity-based user experience for access. For example, one might create a form in which only Manager or Director level employees have access to a specific form page or form section. The form itself can natively react to the presence of role information. However, do not forget that it relies on an external system to provide this information (typically via a Web service call or application-tier data integration).
- When provided via a Web or portal, access to Workplace Forms is managed the same as other content.

10.3 Workplace Forms sample portlets

Workplace Forms Server provides two sample portlets. As of the 2.61 release, these include:

- FormListPortlet: lists forms in a specific folder. Can also be configured to list XML files.
- FormViewPortlet: Provides support for both Zero Footprint and rich display of forms in portal.

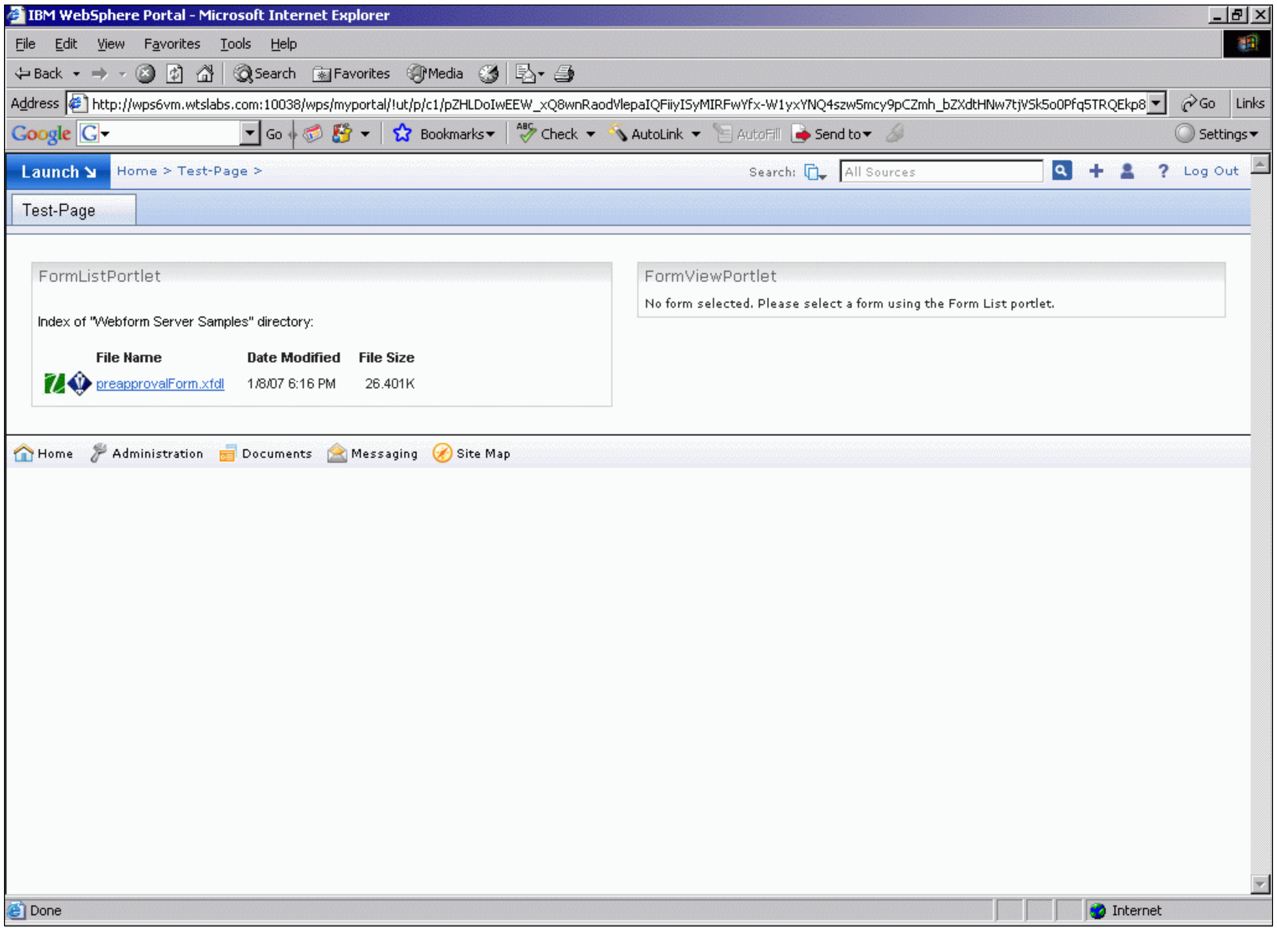
These two portlets can be installed and used out-of-the-box, or extended to meet one's application requirements.

Tip: The default installation location for the sample portlets is:

```
C:\Program Files\IBM\Workplace Forms\Server\2.6\Webform Server\samples\portlet
--> WebformPortletSample.war
--> WebformPortletSample.zip
```

One can install the above .war using the standard means provided by Websphere Portal Server (installation of the Workplace Forms Viewer and Webform Server are still prerequisites).

Figure 10-1 shows the sample portlets running in Portal 6.


IBM WebSphere Portal - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://wps6vm.wtslabs.com:10038/wps/myportal/!ut/p/c1/pZHLDoIwEEW_xQ8wnRaodVlepaIQFiiyI5yMIRFwYfx-W1yxYNQ4szw5mcy9pCZmh_bZXdtHNw7tjVSk5o0Pfq5TRQEkp8
Go Links
Bookmarks Check AutoLink AutoFill Send to Settings
Launch
Home > Test-Page >
Search: All Sources
Log Out
Test-Page
FormListPortlet
FormViewPortlet
Home Administration Documents Messaging Site Map
Done Internet

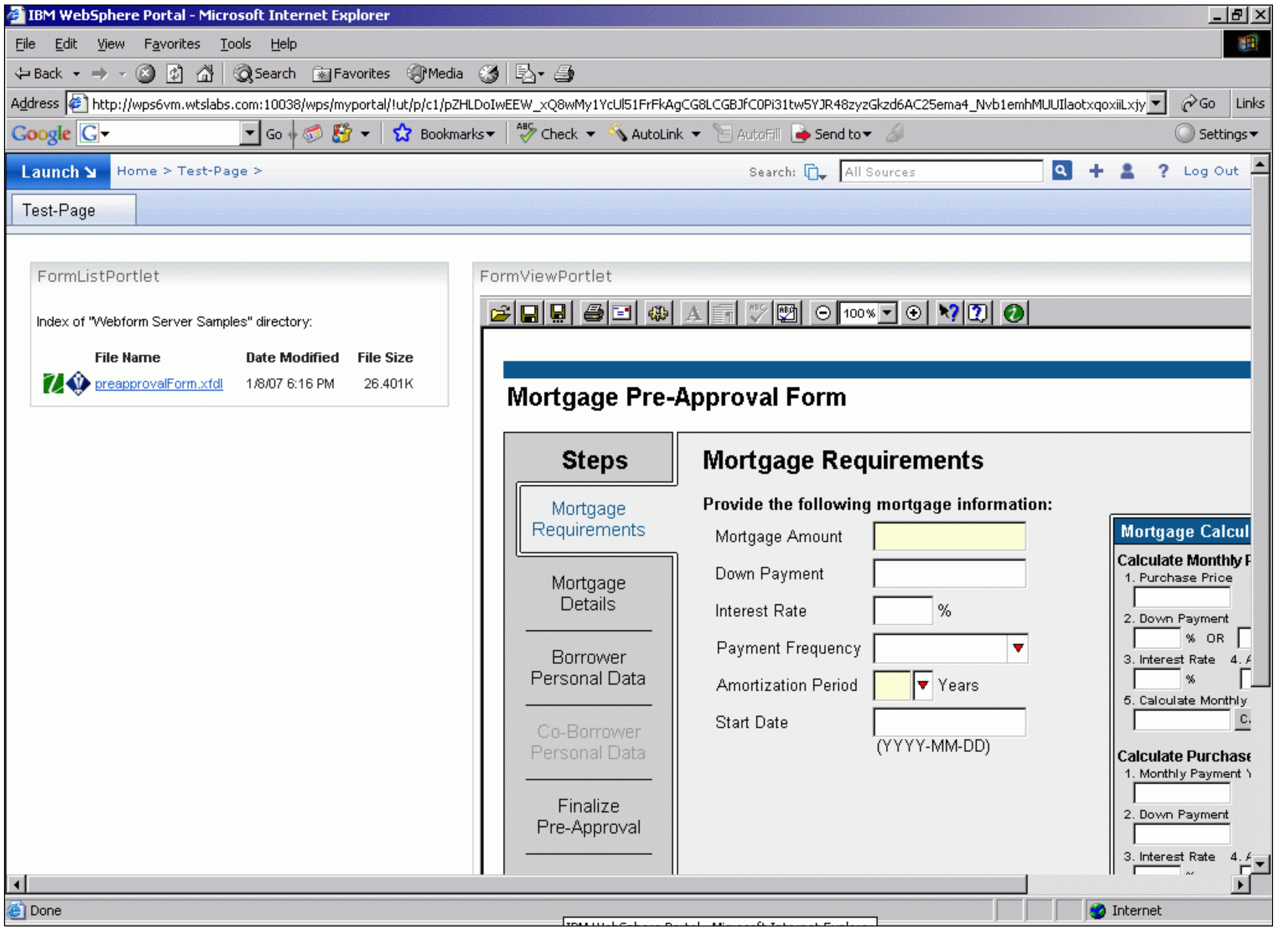
No form selected. Please select a form using the Form List portlet.

Index of "Webform Server Samples" directory:

File Name	Date Modified	File Size
preapprovalForm.xfdl	1/8/07 6:16 PM	26.401K

Figure 10-1 Sample portlets running In WebSphere Portal Server 6

When we look at Figure 10-1 on page 635 we note that the FormViewPortlet is currently blank. This is because we have not yet selected a form to display within the FormListPortlet. Let us click the default sample form and see what happens.


IBM WebSphere Portal - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://wps6vm.wtslabs.com:10038/wps/myportal/!ut/p/c1/pZHLDoIwEEW_xQ8wMy1YcUl51FrFkAgCG8LCGBJfC0Pi31tw5YJR48zyzGkzd6AC25ema4_Nvb1emhMUUIlaotxqoxiiLxjy
Go Links
Bookmarks Check AutoLink AutoFill Send to Settings
Launch Home > Test-Page > Search: All Sources Log Out
Test-Page
FormListPortlet
FormViewPortlet
100%
Mortgage Pre-Approval Form
Steps
Mortgage Requirements
Mortgage Details
Borrower Personal Data
Co-Borrower Personal Data
Finalize Pre-Approval
Mortgage Requirements
Provide the following mortgage information:
Mortgage Amount
Down Payment
Interest Rate %
Payment Frequency
Amortization Period Years
Start Date
(YYYY-MM-DD)
Mortgage Calcul
Calculate Monthly P
1. Purchase Price
2. Down Payment
% OR
3. Interest Rate 4.
%
5. Calculate Monthly
Calculate Purchase
1. Monthly Payment
2. Down Payment
3. Interest Rate 4.
Done Internet

Index of "Webform Server Samples" directory:

File Name	Date Modified	File Size
preapprovalForm.xfdl	1/8/07 6:16 PM	26.401K

Figure 10-2 Sample portlets displaying sample Mortgage Pre-Approval Form via the Workplace Forms Server

Tip: The sample portlets .war file contains one sample form. You can add your own forms to the installedApps directory manually or into the .war before it is deployed.

10.4 Options for displaying Workplace Forms in portal

As previously mentioned, there are two options available for utilizing IBM Workplace Forms from in a portal:

- Embed the Viewer as an HTML object into a JSP.
- Leverage Webform Server to translate our XFDL forms into HTML in real time on a page-by-page basis.

Tip: In order to deliver 0-footprint forms, we *must* extend the base-class portlet (IBMWorkplaceFormsServerPortlet) provided by Webform Server. Call-outs to Webform Server or the Translator are not possible.

In the following sections, we go into greater depth about how to do each of these.

10.5 Hello World example: embedded Viewer approach

In this section we use a Hello World example of an embedded View approach.

Embedding the Viewer

One can embed the Workplace Forms Viewer into a Web page — HTML or JSP. In the case of portal we return a JSP that contains an embedded Workplace Form. Let us walk through a Hello World style example to show how this can be done:

1. Create the form using the IBM Workplace Forms Designer. In this case, we reuse the form from the Redbooks project.
2. Create a new default portlet. The portlet we created using Rational Application Developer is shown in Example 10-1.

Example 10-1 Hello World portlet - (HTML embedded Viewer): Displays FormView-HelloWorld JSP

```
package com.ibm.workplaceforms;

import java.io.*;

import javax.portlet.*;

/**
 * Hello World Example Portlet for IBM Workplace Forms 2.61 Redbook
 */
public class HelloWorld extends GenericPortlet {

   //Constants for locating response file
   public static final String JSP_FOLDER = "/jsp/"; // JSP folder name
   public static final String VIEW_JSP = "FormView-HelloWorld"; // JSP file name to be rendered
on the view mode

   public void init(PortletConfig config) throws PortletException{
      super.init(config);
   }

   public void doView(RenderRequest request, RenderResponse response) throws PortletException,
IOException {
      // Set the MIME type for the render response and invoke the JSP to render
      response.setContentType(request.getResponseContentType());
      PortletRequestDispatcher rd =
getPortletContext().getRequestDispatcher(getJspFilePath(request, VIEW_JSP));
      rd.include(request,response);
   }

   public void processAction(ActionRequest request, ActionResponse response) throws
PortletException, java.io.IOException {
      // Process Action is not Implemented in this Hello World Example
   }

   /**
    * Returns JSP file path.
    */
   private static String getJspFilePath(RenderRequest request, String jspFile) {
      String markup = request.getProperty("wps.markup");
      if( markup == null )
         markup = getMarkup(request.getResponseContentType());
      return JSP_FOLDER+markup+"/"+jspFile+"."+getJspExtension(markup);
   }

   /**
    * Convert MIME type to markup name.  Currently only html is supported.
    */
   private static String getMarkup(String contentType) {
      return "html";
   }

   /**
    * Returns the file extension for the JSP file
    */
   private static String getJspExtension(String markupName) {
      return "jsp";
   }
}
```

Note the simplicity of the doView method. All that we do is set the response type and return a JSP.

3. Create a new JSP named FormView-HelloWorld.

   In addition to the standard JSP or HTML markup, there are two required sections. In order to be clear about this, refer to Example 10-2.

Example 10-2 Hello World portlet - (HTML embedded Viewer): JSP page stub

```
<%@ page contentType="text/html"%>
<HTML>
<BODY>
<!-- Insert OBJECT declaration section here -->
<!-- Insert SCRIPT declaration section here (contains XML Form Body) -->
</BODY>
</HTML>
```

Now we add the OBJECT section. In our project it is as shown in Example 10-3.

Example 10-3 Hello World portlet - (HTML embedded Viewer): JSP OBJECT section

```
<OBJECT id="HELLOWORLD" classid="CLSID:354913B2-7190-49C0-944B-1507C9125367" width="850"
height="650" ViewAsText>
      <PARAM NAME="XFDLID" VALUE="XFDLForm"/>
      <PARAM NAME="TTL" VALUE="5"/>
      <PARAM NAME="detach_id" VALUE="1975102219860416"/>
      <PARAM NAME="retain_Viewer" VALUE="on"/>
</OBJECT>
```

A brief description of the elements of this section is given in Table 10-1.

Table 10-1 Descriptions of HTML/JSP OBJECT section parameters used for Viewer embedding

Name	Description
id	Identifier for this object.

Name	Description
classid	Specifies the Workplace Forms Viewer.
width	Width of embedded Viewer in pixels. Typically one should add 50 to the form height.
height	Height of embedded Viewer in pixels. Typically one should add 50 to the form width.
XFDLID	Identifier for this instance of the form.
TTL	TIme To Live - The number of seconds that the Viewer will remain resident in memory while waiting for a page refresh/submission.
detach_id	A unique indentifier for this instance of the Viewer. Ensure that this is different for each instance of the Viewer running embedded this way on a client PC.
retain_Viewer	Flag to retain viewer in memory for a maximum of TTL (see above description) seconds.

Lastly, we embed the form body in-line, within the SCRIPT section. See Example 10-4.

Example 10-4 Hello World portlet - (HTML embedded Viewer): SCRIPT section

```
<SCRIPT language="XFDL" id="XFDLForm" type="application/vnd.xfdl; wrapped=comment">
   <!--
<?xml version="1.0" encoding="ISO-8859-1"?>
<XFDL xmlns:custom="http://www.ibm.com/xmlns/prod/XFDL/Custom"
xmlns:designer="http://www.ibm.com/xmlns/prod/workplace/forms/designer/2.6"
xmlns:ev="http://www.w3.org/2001/xml-events" xmlns:xfdl="http://www.ibm.com/xmlns/prod/XFDL/7.0"
xmlns:xforms="http://www.w3.org/2002/xforms" xmlns="http://www.ibm.com/xmlns/prod/XFDL/7.0"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <globalpage sid="global"> ...
...
<!-- Omitted Most of Form Body -->
...
</XFDL>
   -->
</SCRIPT>
```

Note that the above SCRIPT section is quite simple. The complete XML form body is embedded in-line within the JSP.

Important: It is considered a best practice to compress forms that are embedded this way (GZip, Base 64 encoded). Compression during saving or transmission is an option in the Workplace Form Designer and can also be handled programatically with the Workplace Forms Server API.

Note the attributes within the SCRIPT element and also that the form body is wrapped with comment tags.

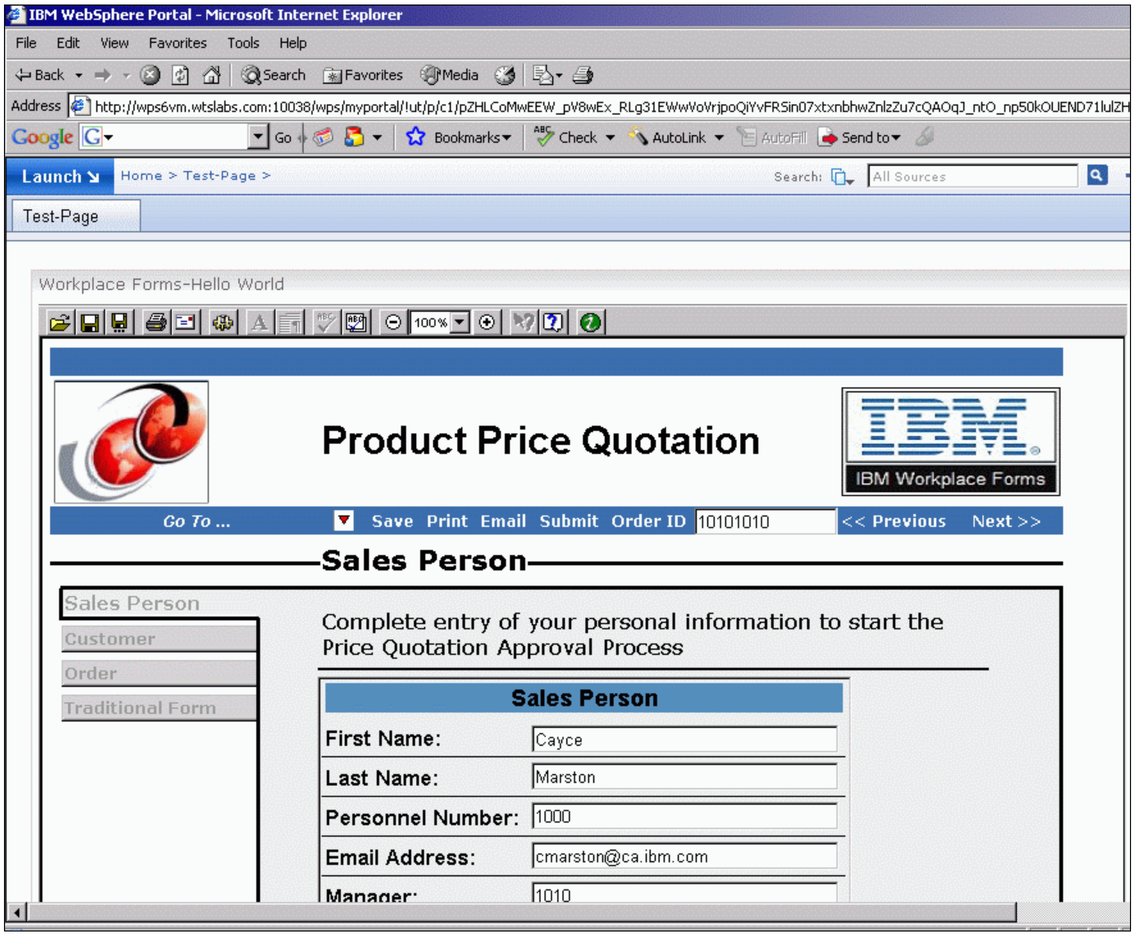
Tip: Note that in a production environment, the form body would almost always be passed into the form via a bean. One would not generally embed a static section of XFDL into their JSP. Recall that in enterprise deployments of Workplace Forms, form templates (blank forms) are typically stored either in the data tier (DB2, Content Manager, and so on) or deployed as part of the Web application (.war or .ear file).

Export the project as a .WAR file and deploy to portal.

Export the project as you would any other portlet and install it into your portal server via the admin interface.

4. Test the portlet and form.

   Now let us test out our Hello World JSP. See Figure 10-3.


IBM WebSphere Portal - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address
Google Go Bookmarks Check AutoLink AutoFill Send to
Launch
Home > Test-Page >
Search: All Sources
Test-Page
Workplace Forms-Hello World
100%
IBM Workplace Forms
Go To ... Save Print Email Submit Order ID
<< Previous Next >>
Sales Person
Customer
Order
Traditional Form

http://wps6vm.wtslabs.com:10038/wps/myportal/!ut/p/c1/pZHLCoMwEEW_pV8wEx_RLg31EWwVoVrjpoQiYvFRSin07xtxnbhwZnlzZu7cQAOqJ_ntO_np50kOUEND71lulZH

Product Price Quotation

Order ID 10101010

Sales Person

Complete entry of your personal information to start the Price Quotation Approval Process

Sales Person

First Name:	Cayce
Last Name:	Marston
Personnel Number:	1000
Email Address:	cmarston@ca.ibm.com
Manager:	1010

Figure 10-3 Redbooks form displayed via Viewer embedding in Portal 6

Note that the width and height have been set based on the corresponding parameters in the JSP Object section.

10.6 Hello World example: Zero Footprint forms in portal

In this section we provide a Hello World example: Zero Footprint forms in portal.

Webform Server and Zero Footprint forms in portal

The second approach that we demonstrate is to deploy the form in Zero Footprint via Webform Server. In order to do so, we leverage the sample portlets provided with Webform Server.

The first step is to add the Redbooks form to the Samples folder. This can be done in two ways:

- Prior to installing .war: Unpack the .war, add the file, and repackage the .war file.
- After installing .war: Manually copy the file into the samplesForms subfolder in the installedApps subdirectory. In this case it was found in the following directory:

  ```
  C:\WebSphere\PortalServer\installedApps\WebformSamplePortlets_PA_fi677bk.ear\PA
  _fi677bk.war\SampleForms
  ```

  This approach is only suggested for demo purposes or situations where you cannot properly repackage and redeploy a .war file. A good way to locate this folder is to sort the installed applications by name or date.

Another approach that would have involved a little more work would have been to modify our HelloWorld portlet to extend the IBMWorkplaceFormsServerPortlet base class provided by Webform Server. In doing so, we also have to take the additional measure of implementing two additional methods, doViewEx and processActionEx, and relocating the contents of our current doView and processAction methods into these. As an in-depth discussion of this is beyond the scope of this chapter, refer to the *Workplace Forms and Portal Integration Guide*, posted to the IBM Solutions Catalogue, and also to product documentation.

10.7 Managing use of rich versus Zero Footprint forms

In this section we discuss managing the use of rich versus Zero Footprint forms.

10.7.1 Detecting the presence of the Workplace Forms Viewer

It is worthwhile at this point to show how we can programatically detect the presence of the Viewer from within our portlet.

Example 10-5 Code snippet showing how to programmatically detect the presence of the Viewer on the client PC

```
//Detect the presence of the Viewer
            String result = super.getViewerVersion(request)

if(result == null)){
   // Viewer is not installed, take appropriate action
} else {
   // String contains either the version of the Viewer, or the value “installed”.
}
```

The method getViewerVersion is provided by the IBMWorkplaceFormsServerPortlet base class. “request” is the PortletRequest object.

Tip: The presence of the Workplace Forms Viewer on the client system can be detected. If the Viewer is available on the client, one can return the XML form. If not, Webform Server can be used to translate the form into HTML.

Restriction: This method will detect Version 6.2 and later of the Viewer, and Version 2.5 and later of the IBM branded Viewer.

Note that the version number returned for the Viewer may not match the product version. For example, the IBM Workplace Forms Viewer Version 2.5 will return a version number of 6.5, which corresponds to the version of XFDL utilized by that release of the Viewer. As such, it is important to always test your application to ensure that you know what value it will return.

10.7.2 Forcing delivery of HTML or XML forms

By default, the IBMWorkplaceFormsServerPortlet base class will automatically detect the presence of the Workplace Form Viewer on the client system. However, if so desired, one can bypass this mechanism to specify delivery of either HTML or XFDL. Here is a code snippet showing how to do so.

Example 10-6 Code snippet showing how to programmatically force HTML or XFDL delivery of forms

```
// Used to set the desired
   String requestMode = viewer;

// Set flags in ancestor to reflect mode.
   if ("viewer".equals(requestMode))
      super.useXFDL(request, true);
   else if ("pws".equals(requestMode))
      super.useHTML(request, true);
```

Note that we call the useXFDL method provided by the IBMWorkplaceFormsServerPortlet class to set the response type.

10.8 Keeping form submissions in-context

Up until this point we have simply shown how to put a form on the glass in portal. To accomplish anything more useful, we need to be able to submit the form back to the server-side for processing. In this section, we walk through the steps needed to do so. However, first, let us touch on some key points.

Key points about Form submissions in portal

Key points are:

- Portlet submission URLs are dynamically generated.
- Since URLs are not known in advance, we have to pass them into the form at run time.
- Generated portlet submission URLs can contain one or more actions, which can be detected and processed within the processAction (or, if you are using Webform Server, the processActionEx method).
- There are several ways to pass the URL into a form. These include:
  - Using the Workplace forms API to set the value into the form.
  - Viewer only: passing an init parameter into the Viewer from the JSP and reading the value within the form. (Pass the URL into the JSP via a bean.)

– Viewer only: Bind the URL element to the XForms Model and set the corresponding data instance from within the JSP. (Pass the URL into the JSP via a bean.)

Tip: When using Webform Server, one cannot submit a form directly to a different servlet or portlet, as there is only one page (in HTML) on the client side. The key here is that the complete XML form is maintained on the server side, and is not present on the client.

Let us build on the previous Viewer-based example to enable form submissions to our portlet.

1. Launch RAD and open the portlet.
2. Create a simple bean that can be used to pass data into our JSP. In this case we provided simple accessor and mutator methods called setValue and getValue.
3. Add the lines given in Example 10-7 to the doView method to generate the submission URL.

Example 10-7 doView code snippet to generate submission URL and write it into bean

```
//Generate a submission URL, add the "save" action and write it into the bean
System.out.println("Generating Submission URL");
PortletURL submitURL = response.createActionURL();
submitURL.setPortletMode(PortletMode.VIEW);
submitURL.setParameter("action", FORM_SUBMIT);
bean.setValue("submitURL", submitURL.toString());
```

4. Add the lines given in Example 10-8 to doView to write the bean into the request.

Example 10-8 doView code snippet to write the bean into the request

```
//Write the bean into the request
System.out.println("Setting bean into request\n");
request.setAttribute("bean", bean);
```

5. Now we need to pass the generated URL into our JSP so that it can be provided to the form. An alternate approach would be to use the Workplace Forms API to push this value into the form programmatically within our portlet code.

Tip: There are two standard means of passing a data value into the form from within a JSP:

- Use a bean to pass each value or a complete instance into the JSP and have the Viewer merge the data instance into the form at runtime. This is described in detail in the standard product documentation “Workplace Forms Embedding the Viewer in HTML Web Pages”.
- Provide the data as a PARAMETER within the OBJECT section, and use the Viewer function param to read the value into the form within your XFDL. This approach is illustrated in the IBM Workplace Forms integration sample for IBM WebSphere Portal on developerWorks® at:

  `http://www-128.ibm.com/developerworks/workplace/library/d-wp-forms-portal/`

  For information about and an example of using the param Viewer function, refer to the product documentation titled “Workplace Forms Introduction to the Viewer Functions”.

Example 10-9 JSP code snippet showing loading of submitURL from bean

```
    <%= bean.getValue("submitURL")%>
```

6. To detect the form submission save action, add the lines given in Example 10-10 to the processAction method.

Example 10-10 processAction code snippet to detect form submission

```
  String action = request.getParameter("action");
  if (action != null && action.equals(FORM_SUBMIT)){
        //Set the action for processing in doView
        PortletSession portlet_Session = request.getPortletSession(true);
        portlet_Session.setAttribute(PORTLET_VIEW_STATE, SUBMIT_ACTION_NAME);
  }else{
        // Take appropriate action here to handle other actions or for exception processing
   }
```

7. Now in doView we add code to return a different JSP on form submission. See Example 10-11.

Example 10-11 doView code snippet to set response JSP based on PORTLET_VIEW_STATE attribute

```
  //Attempt to get the portlet View State from the session.  If none exists, use default
     if ((viewState = (String) portlet_Session.getAttribute(PORTLET_VIEW_STATE)) != null){
        //WP_Forms_Example: doView: set response to submission received JSP
        JSP = SUBMISSION_JSP;
     }else{
        //WP_Forms_Example: doView: viewState is null, default template will be returned
     }
```

These code samples are provided as one means of writing your form-processing portlet. As with most programming tasks, there are often many ways to deliver the desired functionality. A number of the variables and constants used, such as PORTLET_VIEW_STATE, need to be defined for these examples to work within the context of your portlet.

10.9 Inter-portlet communication

Inter-portlet communication can be achieved through a number of standard means. Those who are familiar with developing portlets should be comfortable with these concepts. With IBM Workplace Forms based portal solutions, the standard means of passing data between portlets still is true. However, there is often an additional step required to merge data into one’s form or form template.

A

Upgrading Version 2.5 forms

This appendix discusses the steps we take in upgrading the original form from the Workplace Forms V2.5 book to XFDL Version 7.0. We also show how we resolve errors that we encounter during the upgrade process.

Differences between Designer 2.5 and 2.6

Designer 2.6 is very different from Designer 2.5. Some of the main improvements in Designer 2.6 are:

- The Designer interface is entirely new. Designer is now based on the Eclipse Platform, and the Designer interface is the Eclipse Workbench.
- The Designer now supports XFDL 7.0.
  - You can use Designer to upgrade forms from XFDL 6.x to XFDL 7.0.
  - The namespace URL for XFDL 7.0 is: `http://www.ibm.com/xmlns/prod/XFDL/7.0`
- The Designer now supports XForms 1.0.
- The Designer is now available in several different languages and locales.

Forms created on Workplace Forms Designer V2.6.1 are based on XFDL 7.0, and this is the version that existing forms are upgraded.

Upgrading forms

You can use the Designer to create and edit forms. Forms created in the Designer are based on XFDL 7.0. To edit a form that is based on an earlier version of XFDL (for example, a form created in an older version of the Designer), you must upgrade the form to XFDL 7.0. You can only upgrade forms based on XFDL 6.0 or later.

Background

Forms created in the Designer are based on XFDL 7.0. To edit a form that is based on an earlier version of XFDL (for example, a form created in an older version of the Designer), you must upgrade the form to XFDL 7.0. The Designer can only upgrade forms based on XFDL 6.0 or later.

In this appendix, we follow the steps that we perform to upgrade the form from the IBM Workplace Forms V2.5 Redbooks to XFDL 7.0. We encounter several error messages, and we show how we resolve these error messages.

Note: The Designer may encounter difficulty upgrading forms with complicated formulas or custom information. Make sure that you thoroughly test all upgraded forms.

Attention: Since the Designer can only upgrade forms based on XFDL 6.0 or later, any forms that are based on versions prior to XFDL 6.0 must first be upgraded using IBM Workplace Forms Designer V2.5, prior to upgrading in the Designer to XFDL 7.0.

Upgrading the form from the previous book

To upgrade:

1. To upgrade the sample form from the V2.5 book, select **File** → **New** → **Upgrade Workplace Form**, as shown in Figure A-1. To open the Upgrade Workplace Form(s) window, see Figure A-2 on page 649.

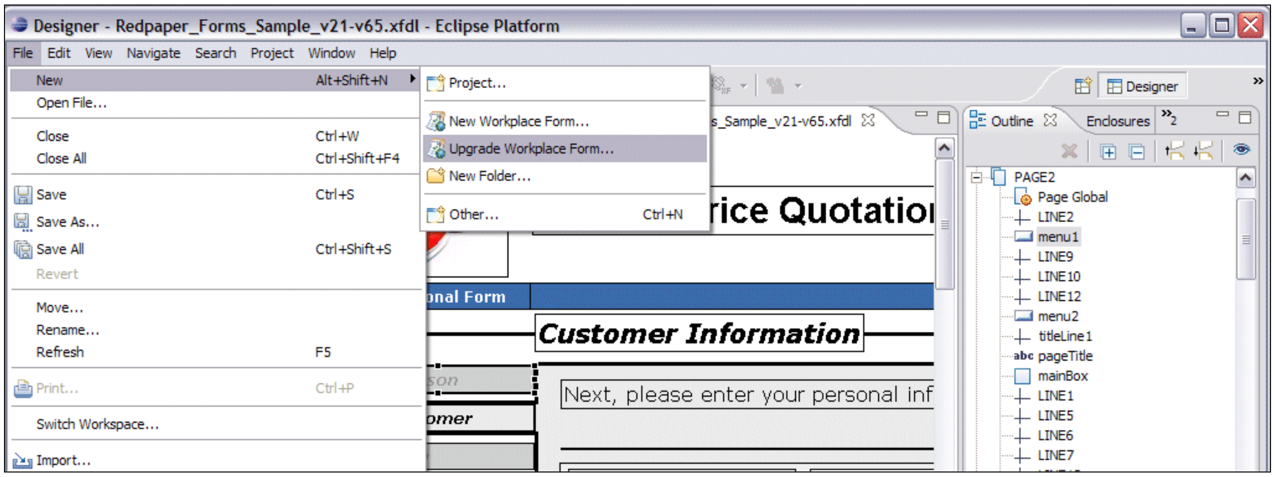


Figure A-1 Upgrade form

Note: File → New → Upgrade Workplace Form is only available in the Designer perspective. To upgrade a form in any perspective, select **File** → **New** → **Other** and select the **Workplace Forms** → **Upgrade Workplace Form** wizard.

2. To select the sample form file, select **Files** in the File System from the Upgrade Workplace Form(s) window and click **Browse** to select the form, as shown in Figure A-2.

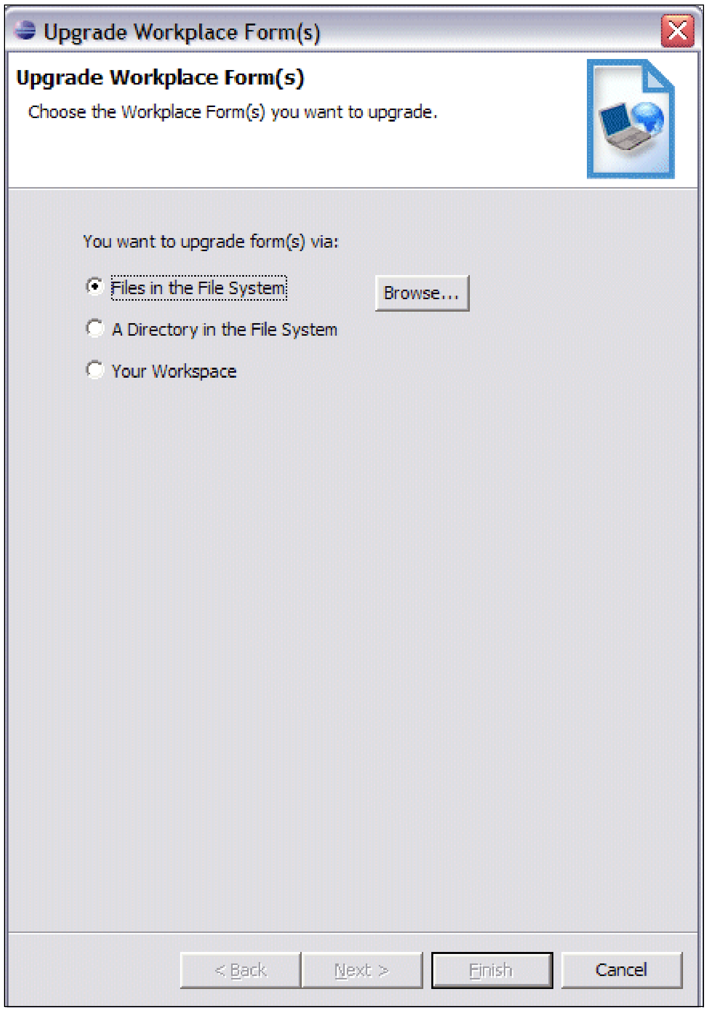
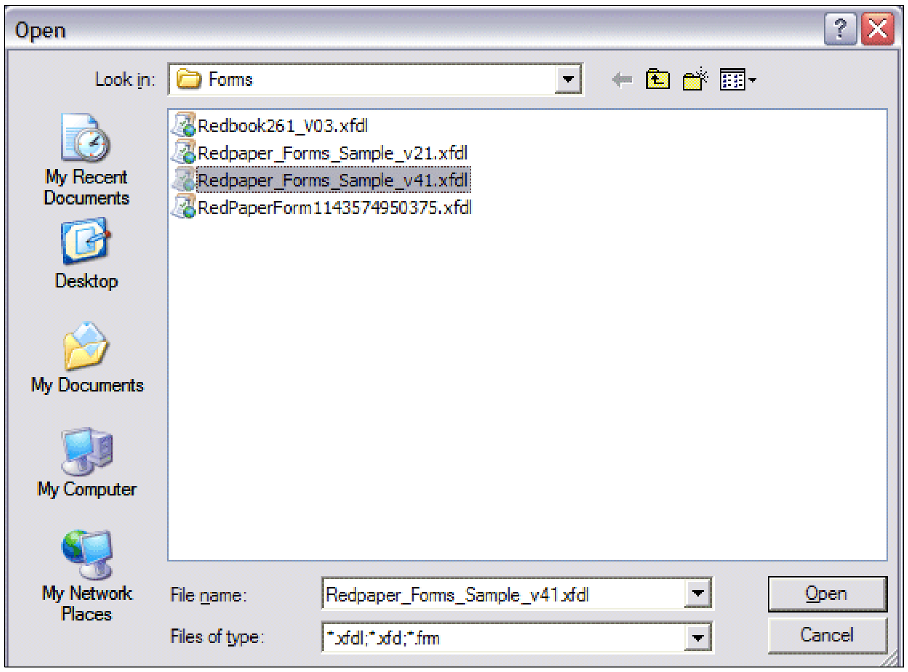

Upgrade Workplace Form(s)
Upgrade Workplace Form(s)
Choose the Workplace Form(s) you want to upgrade.
You want to upgrade form(s) via:
Files in the File System
Browse...
A Directory in the File System
Your Workspace
< Back
Next >
Finish
Cancel

Figure A-2 Select the File System Option, and click Browse

Note: To select a directory of forms, select **A Directory in the File System** from the Upgrade Workplace Form(s) window and click **Browse** to select the directory.

To select forms from existing projects, select **Your Workspace** from the Upgrade Workplace Form(s) window and use the navigation tree to select the forms.

3. Browse to the file location and select the correct sample form file from the dialog, and click **Open**, as shown in Figure A-3.

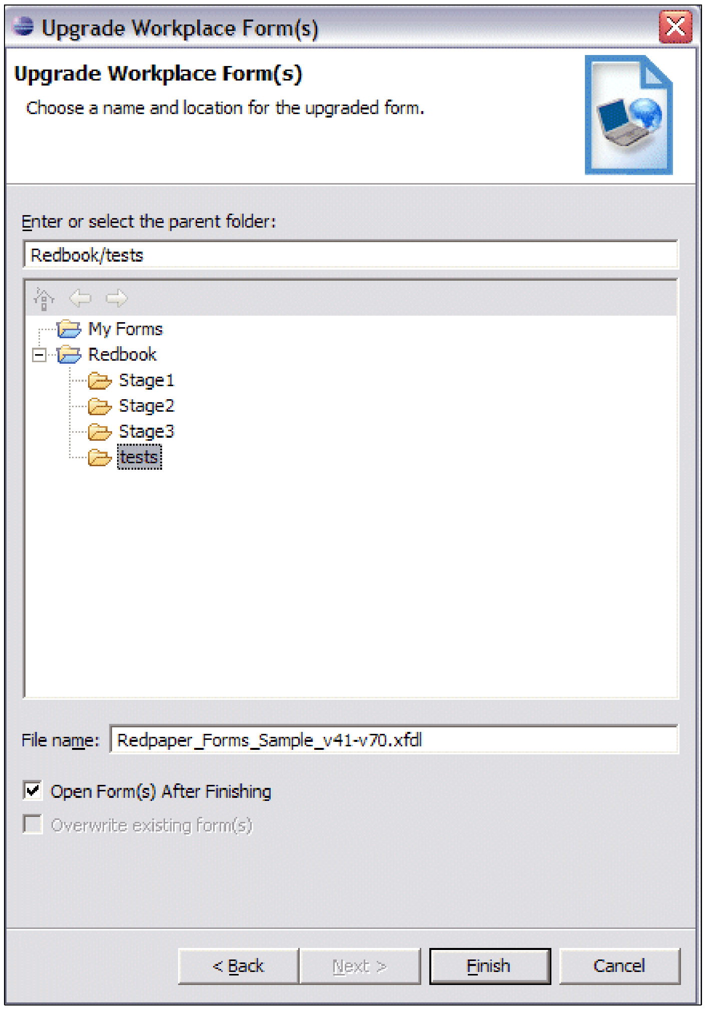


Redbook261_V03.xfdl
Redpaper_Forms_Sample_v21.xfdl
Redpaper_Forms_Sample_v41.xfdl
RedPaperForm1143574950375.xfdl

File name: Redpaper_Forms_Sample_v41.xfdl
Files of type: *.xfdl;*.xfd;*.frm

Figure A-3 Browse to file location

4. For steps 4 to 9, refer to Figure A-4. Click **Next** to display the next page of the wizard.


Upgrade Workplace Form(s)

Upgrade Workplace Form(s)

Choose a name and location for the upgraded form.

Enter or select the parent folder: Redbook/tests

File name: Redpaper_Forms_Sample_v41-v70.xfdl

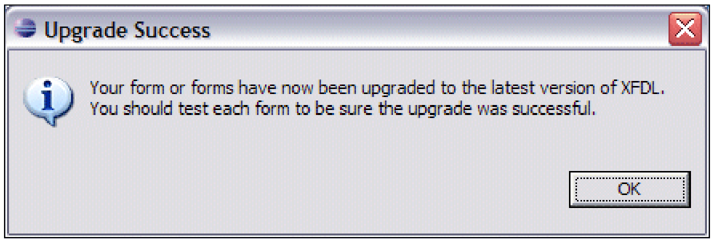
☑ Open Form(s) After Finishing

☐ Overwrite existing form(s)

Figure A-4 Specify where you would like to store the upgraded file

5. Select the project for the new form.
6. In the File name field, type the name of the new form. The default file name is the original file name plus _V70.xfdl.
7. If you want to open the new form, select the **Open Form(s) After Finishing** check box.
8. If you want to overwrite an existing form, select the **Overwrite existing form(s)** check box.
9. Click **Finish**.

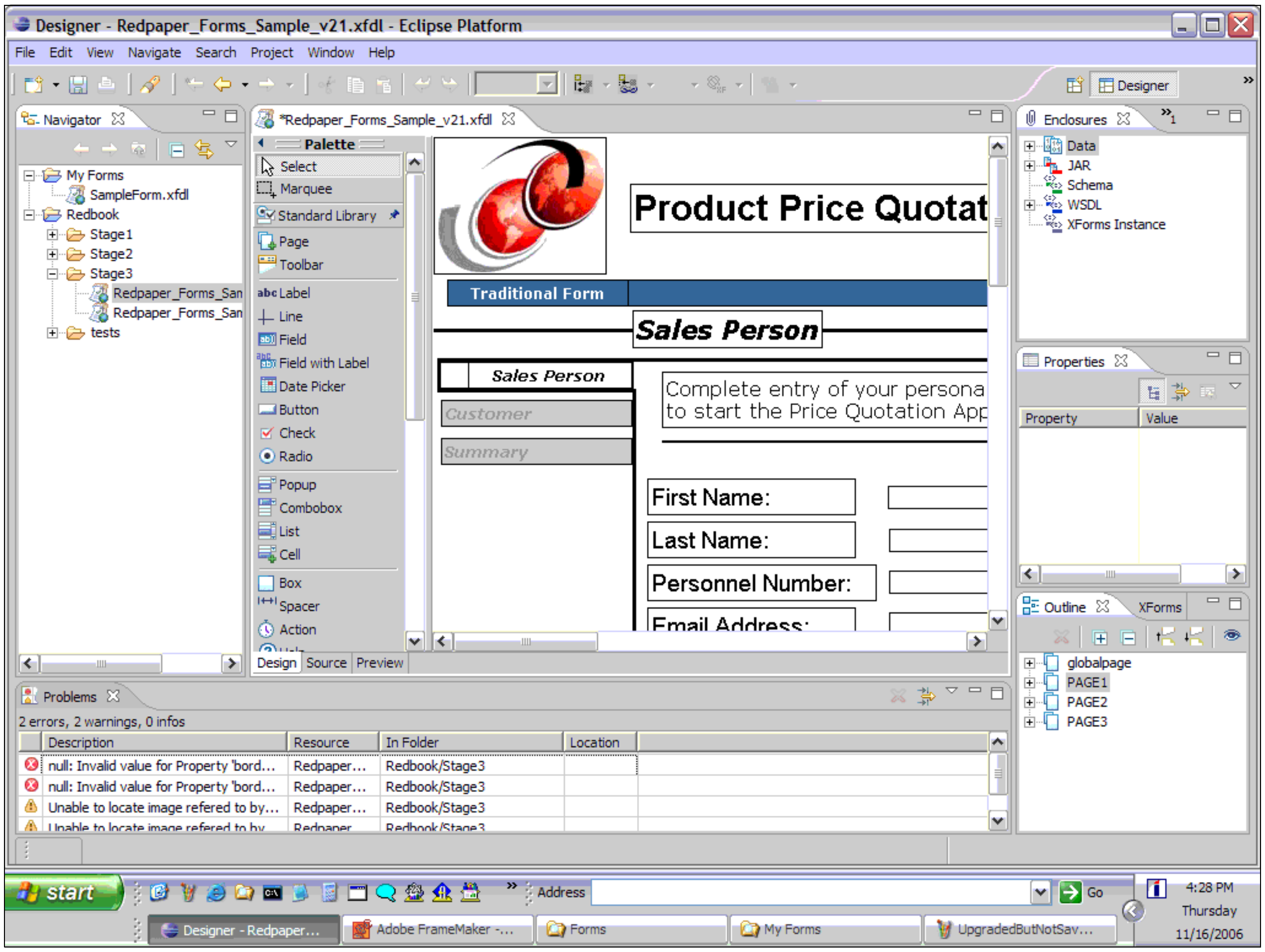
10. An Upgrade Success message box is displayed, as shown in Figure A-5, indicating that the form has been upgraded successfully to XFDL 7.0. However, the form is not yet saved. We recommend that the form be tested to ensure that the upgrade is successful.



Your form or forms have now been upgraded to the latest version of XFDL.
You should test each form to be sure the upgrade was successful.

Figure A-5 New form upgraded but not saved

11. The Designer lists the upgraded form in the Navigator view, as shown in Figure A-6. (You may need to expand the project in the Navigator view to see the list of forms in the project.)



Product Price Quotat
Traditional Form
Sales Person
Sales Person
Customer
Summary
Complete entry of your persona
to start the Price Quotation App
First Name:
Last Name:
Personnel Number:
Email Address:

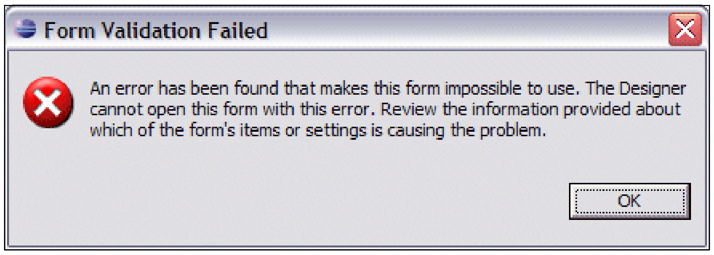
2 errors, 2 warnings, 0 infos

Description	Resource	In Folder	Location
null: Invalid value for Property 'bord...	Redpaper...	Redbook/Stage3	
null: Invalid value for Property 'bord...	Redpaper...	Redbook/Stage3	
Unable to locate image refered to by...	Redpaper...	Redbook/Stage3	
Unable to locate image refered to by...	Redpaper...	Redbook/Stage3	

Figure A-6 Automatic upgrade completed with errors

Preview the upgraded form

When you attempt to preview the form by switching from the Design to the Preview tab, you get the message shown in Figure A-7.

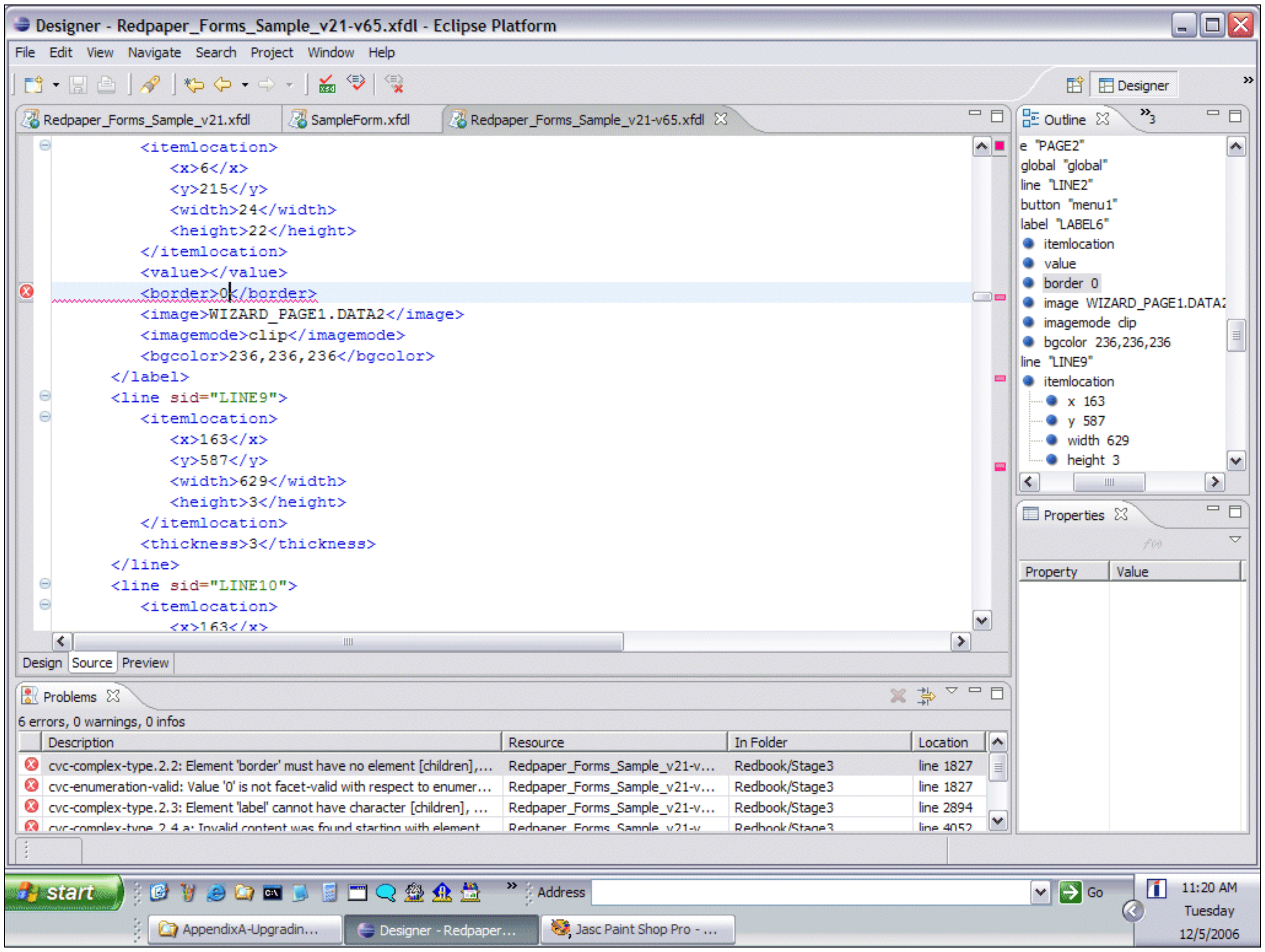


Form Validation Failed

An error has been found that makes this form impossible to use. The Designer cannot open this form with this error. Review the information provided about which of the form's items or settings is causing the problem.

Figure A-7   Validation fails when view of upgraded form attempted

A list of error, warning, and information messages are displayed in the Problems view. The fastest way to resolve the error messages is to go to the source code. Switch to the Source tab to view the source code. You are immediately taken to the first error in the source code, as shown in Figure A-8. We resolve the error by removing the invalid argument of 0 (zero). Click Ctrl+S to save changes and recompile the source code. The first error in the source code is resolved, and it disappears from the Problems view.



Designer - Redpaper_Forms_Sample_v21-v65.xfdl - Eclipse Platform

File Edit View Navigate Search Project Window Help
Designer
Redpaper_Forms_Sample_v21.xfdl
SampleForm.xfdl
Redpaper_Forms_Sample_v21-v65.xfdl
Outline
Properties
Property
Value
Design
Source
Preview
Problems

```
        <itemlocation>
           <x>6</x>
           <y>215</y>
           <width>24</width>
           <height>22</height>
        </itemlocation>
        <value></value>
        <border>0</border>
        <image>WIZARD_PAGE1.DATA2</image>
        <imagemode>clip</imagemode>
        <bgcolor>236,236,236</bgcolor>
     </label>
     <line sid="LINE9">
        <itemlocation>
           <x>163</x>
           <y>587</y>
           <width>629</width>
           <height>3</height>
        </itemlocation>
        <thickness>3</thickness>
     </line>
     <line sid="LINE10">
        <itemlocation>
           <x>163</x>
```

```
e "PAGE2"
global "global"
line "LINE2"
button "menu1"
label "LABEL6"
  itemlocation
  value
  border 0
  image WIZARD_PAGE1.DATA2
  imagemode clip
  bgcolor 236,236,236
line "LINE9"
  itemlocation
    x 163
    y 587
    width 629
    height 3
```

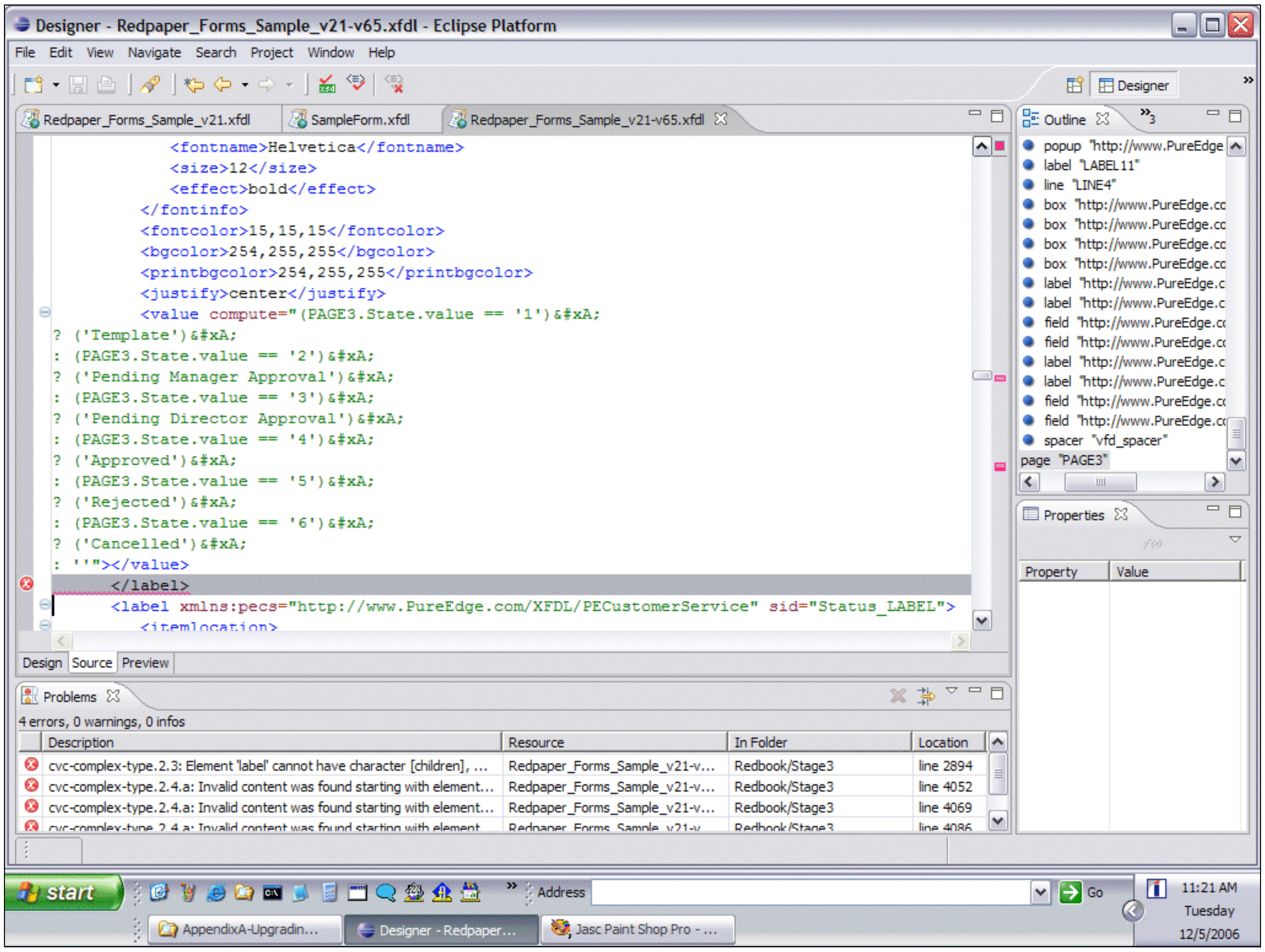
6 errors, 0 warnings, 0 infos

Description	Resource	In Folder	Location
cvc-complex-type.2.2: Element 'border' must have no element [children],…	Redpaper_Forms_Sample_v21-v…	Redbook/Stage3	line 1827
cvc-enumeration-valid: Value '0' is not facet-valid with respect to enumer…	Redpaper_Forms_Sample_v21-v…	Redbook/Stage3	line 1827
cvc-complex-type.2.3: Element 'label' cannot have character [children], …	Redpaper_Forms_Sample_v21-v…	Redbook/Stage3	line 2894
cvc-complex-type.2.4.a: Invalid content was found starting with element	Redpaper_Forms_Sample_v21-v	Redbook/Stage3	line 4052

Figure A-8   Open source code

To go to next issue, click the red box in right-hand frame of the Source tab, or click the next item in the Problems view, as shown in Figure A-9.

The error message indicates that there is an issue with a label definition.



Designer - Redpaper_Forms_Sample_v21-v65.xfdl - Eclipse Platform

```
            <fontname>Helvetica</fontname>
            <size>12</size>
            <effect>bold</effect>
         </fontinfo>
         <fontcolor>15,15,15</fontcolor>
         <bgcolor>254,255,255</bgcolor>
         <printbgcolor>254,255,255</printbgcolor>
         <justify>center</justify>
         <value compute="(PAGE3.State.value == '1')&#xA;
? ('Template')&#xA;
: (PAGE3.State.value == '2')&#xA;
? ('Pending Manager Approval')&#xA;
: (PAGE3.State.value == '3')&#xA;
? ('Pending Director Approval')&#xA;
: (PAGE3.State.value == '4')&#xA;
? ('Approved')&#xA;
: (PAGE3.State.value == '5')&#xA;
? ('Rejected')&#xA;
: (PAGE3.State.value == '6')&#xA;
? ('Cancelled')&#xA;
: ''"></value>
      </label>
      <label xmlns:pecs="http://www.PureEdge.com/XFDL/PECustomerService" sid="Status_LABEL">
         <itemlocation>
```

Problems

4 errors, 0 warnings, 0 infos

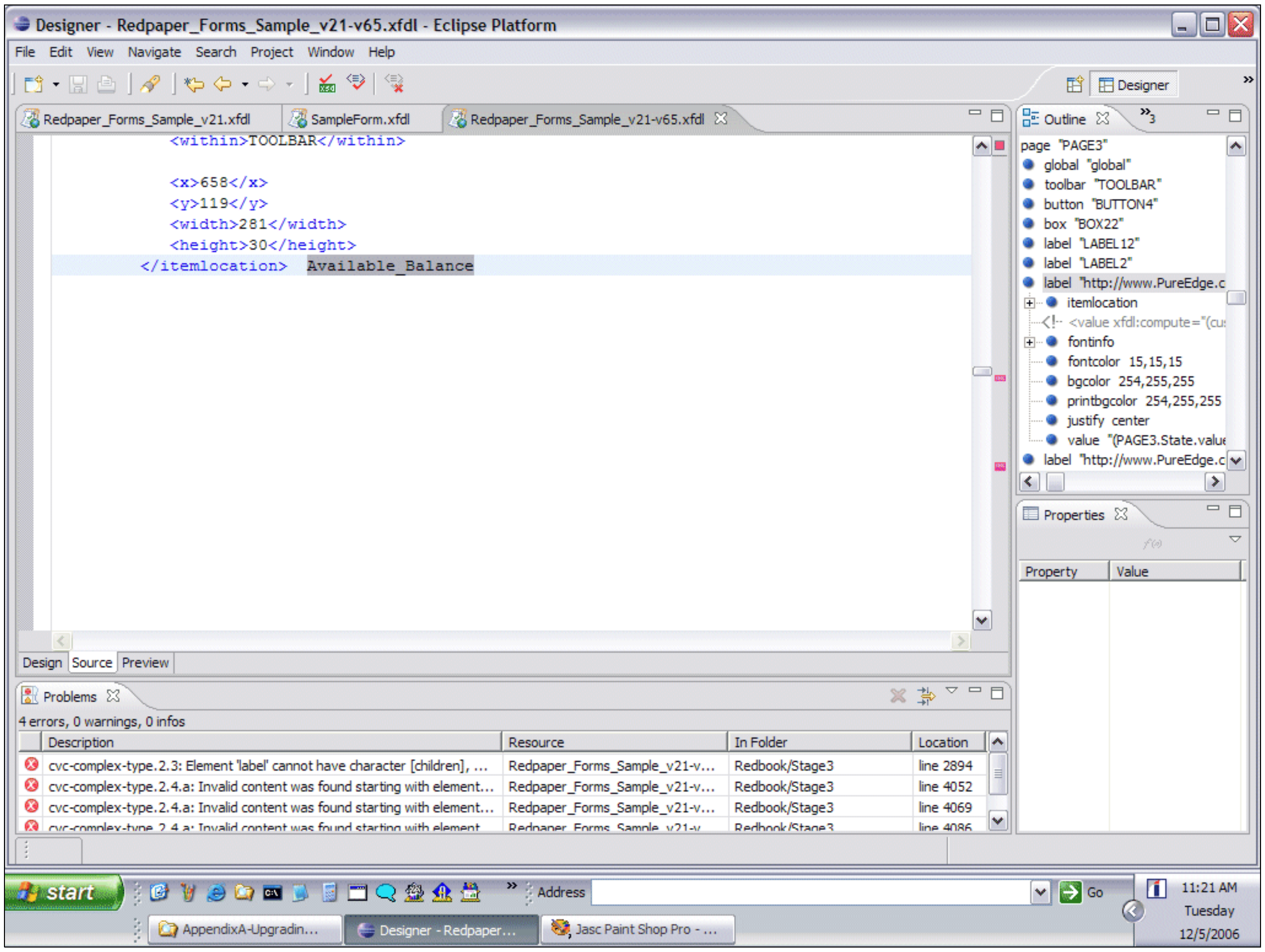
Description	Resource	In Folder	Location
cvc-complex-type.2.3: Element 'label' cannot have character [children], ...	Redpaper_Forms_Sample_v21-v...	Redbook/Stage3	line 2894
cvc-complex-type.2.4.a: Invalid content was found starting with element...	Redpaper_Forms_Sample_v21-v...	Redbook/Stage3	line 4052
cvc-complex-type.2.4.a: Invalid content was found starting with element...	Redpaper_Forms_Sample_v21-v...	Redbook/Stage3	line 4069
cvc-complex-type.2.4.a: Invalid content was found starting with element	Redpaper_Forms_Sample_v21-v	Redbook/Stage3	line 4086

File Edit View Navigate Search Project Window Help
Designer
Redpaper_Forms_Sample_v21.xfdl
SampleForm.xfdl
Redpaper_Forms_Sample_v21-v65.xfdl
Outline
popup "http://www.PureEdge
label "LABEL11"
line "LINE4"
box "http://www.PureEdge.co
label "http://www.PureEdge.c
field "http://www.PureEdge.co
spacer "vfd_spacer"
page "PAGE3"
Properties
Property
Value
Design Source Preview
start
Address
Go
AppendixA-Upgradin...
Designer - Redpaper...
Jasc Paint Shop Pro - ...
11:21 AM
Tuesday
12/5/2006

Figure A-9 Problems view

Obviously, there is nothing wrong with the closing statement, so there must be something wrong inside of the label definition. Start from initial label declaration and scan the code within the label definition for errors.

Notice that there is a text string without tags (Available_Balance) immediately following the initial label declaration tags, as shown in Figure A-10.


Designer - Redpaper_Forms_Sample_v21-v65.xfdl - Eclipse Platform

```
            <within>TOOLBAR</within>

            <x>658</x>
            <y>119</y>
            <width>281</width>
            <height>30</height>
         </itemlocation>  Available_Balance
```

page "PAGE3"
- global "global"
- toolbar "TOOLBAR"
- button "BUTTON4"
- box "BOX22"
- label "LABEL12"
- label "LABEL2"
- label "http://www.PureEdge.c
  - itemlocation
  - <!-- <value xfdl:compute="(cu
  - fontinfo
  - fontcolor 15,15,15
  - bgcolor 254,255,255
  - printbgcolor 254,255,255
  - justify center
  - value "(PAGE3.State.value
- label "http://www.PureEdge.c

Problems

4 errors, 0 warnings, 0 infos

Description	Resource	In Folder	Location
cvc-complex-type.2.3: Element 'label' cannot have character [children], ...	Redpaper_Forms_Sample_v21-v...	Redbook/Stage3	line 2894
cvc-complex-type.2.4.a: Invalid content was found starting with element...	Redpaper_Forms_Sample_v21-v...	Redbook/Stage3	line 4052
cvc-complex-type.2.4.a: Invalid content was found starting with element...	Redpaper_Forms_Sample_v21-v...	Redbook/Stage3	line 4069
cvc-complex-type.2.4.a: Invalid content was found starting with element	Redpaper_Forms_Sample_v21-v	Redbook/Stage3	line 4086

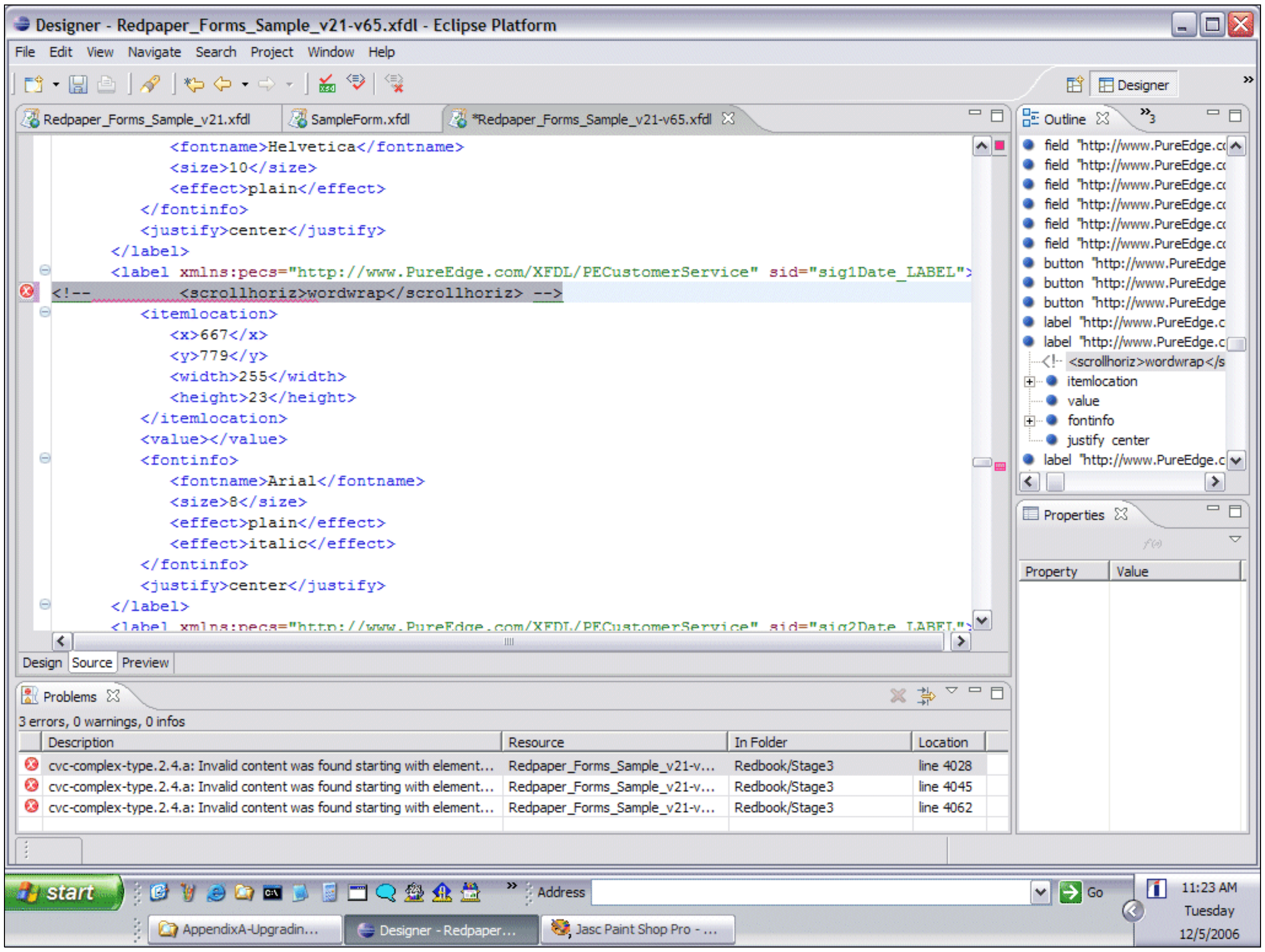
Figure A-10 Source tab showing the extraneous string that needs to be removed

Delete that extraneous string and press Ctrl+S to save and recompile the source code.

Go back to the Problems view and notice that there are several invalid child elements listed as errors. Locate each child element by double-clicking the error messages in the Problems view. The source code is then highlighted in the Source tab.

Comment out the highlighted values, or delete them if you are comfortable with doing so. In our scenario, we comment out the highlighted values to retain history in the code, as shown in Figure A-11.

Note: Version 6.5 of XFDL is more forgiving. Version 7 is more strict. In our scenario, even though the form was validated for Designer V2.5, when we upgraded using Designer V2.6.1, we found these error messages.


Designer - Redpaper_Forms_Sample_v21-v65.xfdl - Eclipse Platform
File Edit View Navigate Search Project Window Help
Designer
Redpaper_Forms_Sample_v21.xfdl
SampleForm.xfdl
*Redpaper_Forms_Sample_v21-v65.xfdl
Outline
field "http://www.PureEdge.co
field "http://www.PureEdge.co
field "http://www.PureEdge.co
field "http://www.PureEdge.co
field "http://www.PureEdge.co
field "http://www.PureEdge.co
button "http://www.PureEdge
button "http://www.PureEdge
button "http://www.PureEdge
label "http://www.PureEdge.c
label "http://www.PureEdge.c
<!-- <scrollhoriz>wordwrap</s
itemlocation
value
fontinfo
justify center
label "http://www.PureEdge.c
Properties
Property
Value
Design
Source
Preview
Problems
start
Address
Go
AppendixA-Upgradin...
Designer - Redpaper...
Jasc Paint Shop Pro - ...
11:23 AM
Tuesday
12/5/2006

```
            <fontname>Helvetica</fontname>
            <size>10</size>
            <effect>plain</effect>
         </fontinfo>
         <justify>center</justify>
      </label>
      <label xmlns:pecs="http://www.PureEdge.com/XFDL/PECustomerService" sid="sig1Date_LABEL">
<!--           <scrollhoriz>wordwrap</scrollhoriz> -->
         <itemlocation>
            <x>667</x>
            <y>779</y>
            <width>255</width>
            <height>23</height>
         </itemlocation>
         <value></value>
         <fontinfo>
            <fontname>Arial</fontname>
            <size>8</size>
            <effect>plain</effect>
            <effect>italic</effect>
         </fontinfo>
         <justify>center</justify>
      </label>
      <label xmlns:pecs="http://www.PureEdge.com/XFDL/PECustomerService" sid="sig2Date_LABEL">
```

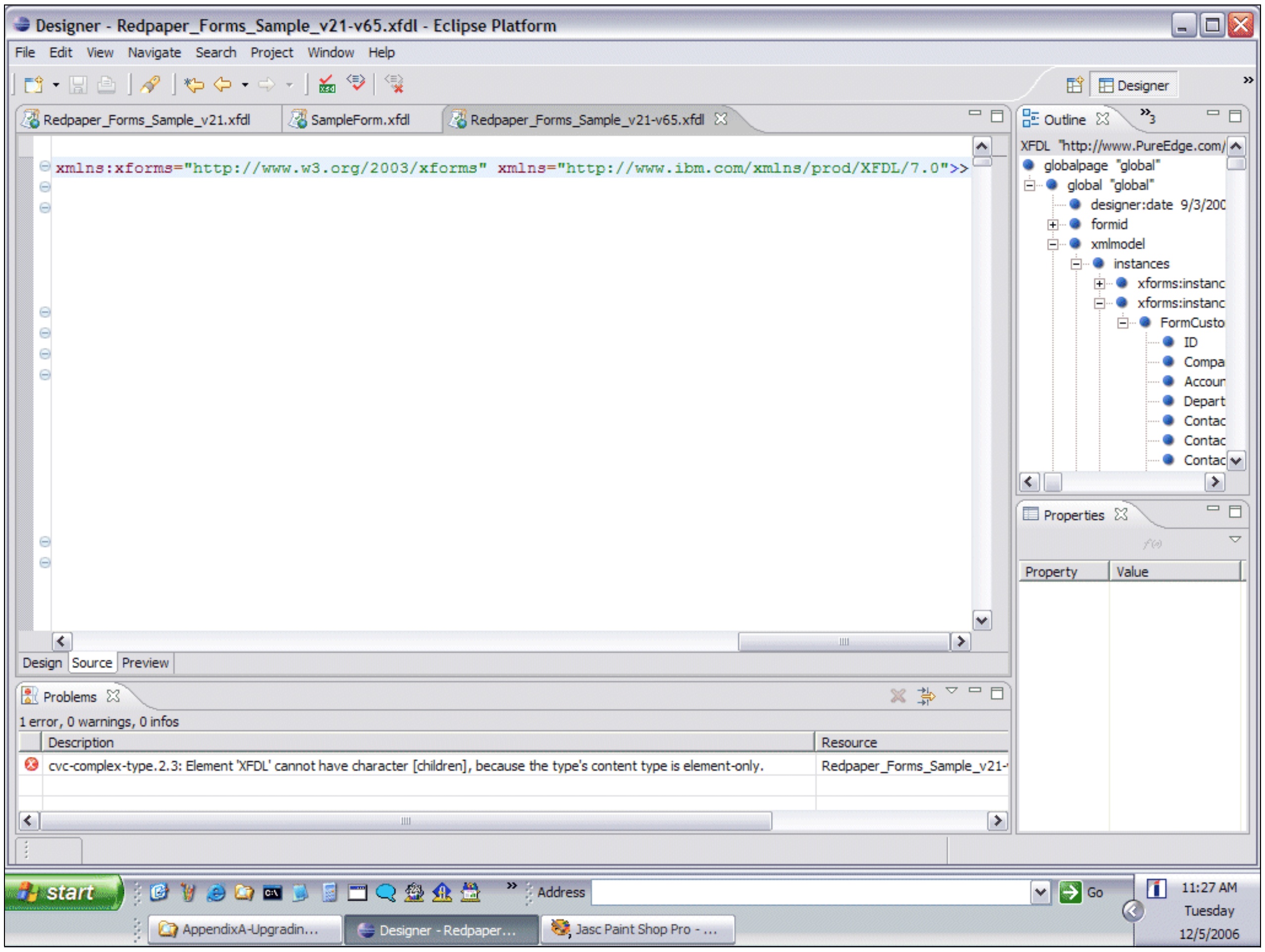
3 errors, 0 warnings, 0 infos

Description	Resource	In Folder	Location
cvc-complex-type.2.4.a: Invalid content was found starting with element...	Redpaper_Forms_Sample_v21-v...	Redbook/Stage3	line 4028
cvc-complex-type.2.4.a: Invalid content was found starting with element...	Redpaper_Forms_Sample_v21-v...	Redbook/Stage3	line 4045
cvc-complex-type.2.4.a: Invalid content was found starting with element...	Redpaper_Forms_Sample_v21-v...	Redbook/Stage3	line 4062

Figure A-11 Invalid Tag <scrollhoriz> - either remove or comment out

The last error in our form is shown in Figure A-12. This error is in the initial namespace declaration. This is an error that was a hard to find, and it took us a while to pinpoint it. An extraneous end bracket is at the end of the initial namespace declaration. As we mentioned previously, the source code compiled with Designer 2.5, but since XFDL V7.0 is more strict, the extraneous end bracket is showing up as an error in Designer 2.6.1.

To correct this error, simply delete the extraneous end bracket, and press Ctrl+S to save the changes.



Designer - Redpaper_Forms_Sample_v21-v65.xfdl - Eclipse Platform
File Edit View Navigate Search Project Window Help
Redpaper_Forms_Sample_v21.xfdl
SampleForm.xfdl
Redpaper_Forms_Sample_v21-v65.xfdl
Design Source Preview
Outline
Properties
Property Value
Problems
start
Address
Go

```
xmlns:xforms="http://www.w3.org/2003/xforms" xmlns="http://www.ibm.com/xmlns/prod/XFDL/7.0">>
```

```
XFDL "http://www.PureEdge.com/
globalpage "global"
global "global"
  designer:date 9/3/200
  formid
  xmlmodel
    instances
      xforms:instanc
      xforms:instanc
        FormCusto
          ID
          Compa
          Accour
          Depart
          Contac
          Contac
          Contac
```

1 error, 0 warnings, 0 infos

Description	Resource
cvc-complex-type.2.3: Element 'XFDL' cannot have character [children], because the type's content type is element-only.	Redpaper_Forms_Sample_v21-

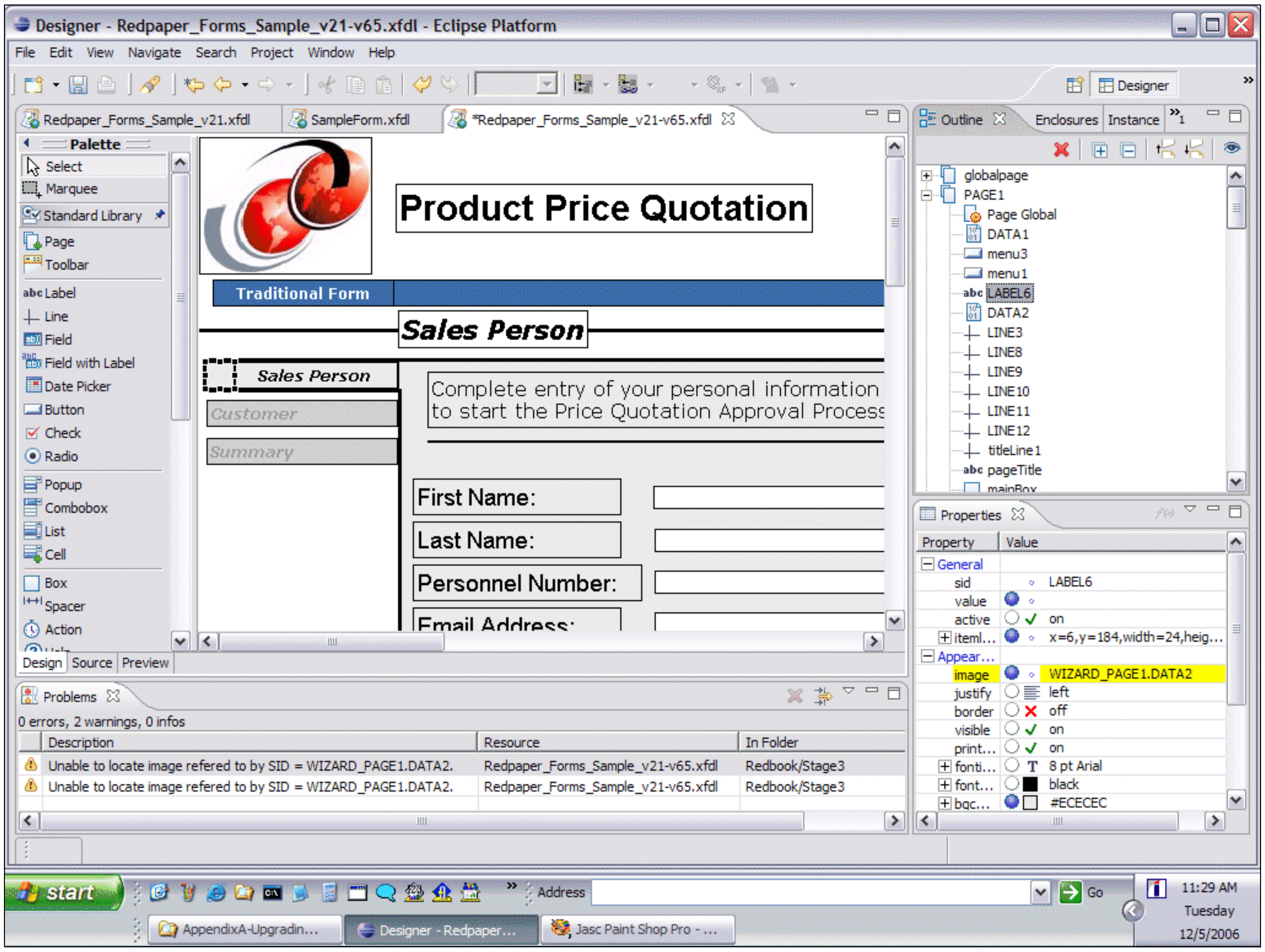
AppendixA-Upgradin... Designer - Redpaper... Jasc Paint Shop Pro - ...

11:27 AM Tuesday 12/5/2006

Figure A-12 Extra end bracket found in namespace declaration

Go back to the Problems view and notice that we have some warnings left, as shown in Figure A-13. Warnings typically do not restrict form function, but if the issues can be resolved then they should be looked into and fixed.

By double-clicking the warning message in the Problems view you can locate the issue in the source code.



Properties

Property	Value
General	
sid	LABEL6
value	
active	✓ on
iteml...	x=6,y=184,width=24,heig...
Appear...	
image	WIZARD_PAGE1.DATA2
justify	left
border	✗ off
visible	✓ on
print...	✓ on
fonti...	8 pt Arial
font...	black
bgc...	#ECECEC

Problems

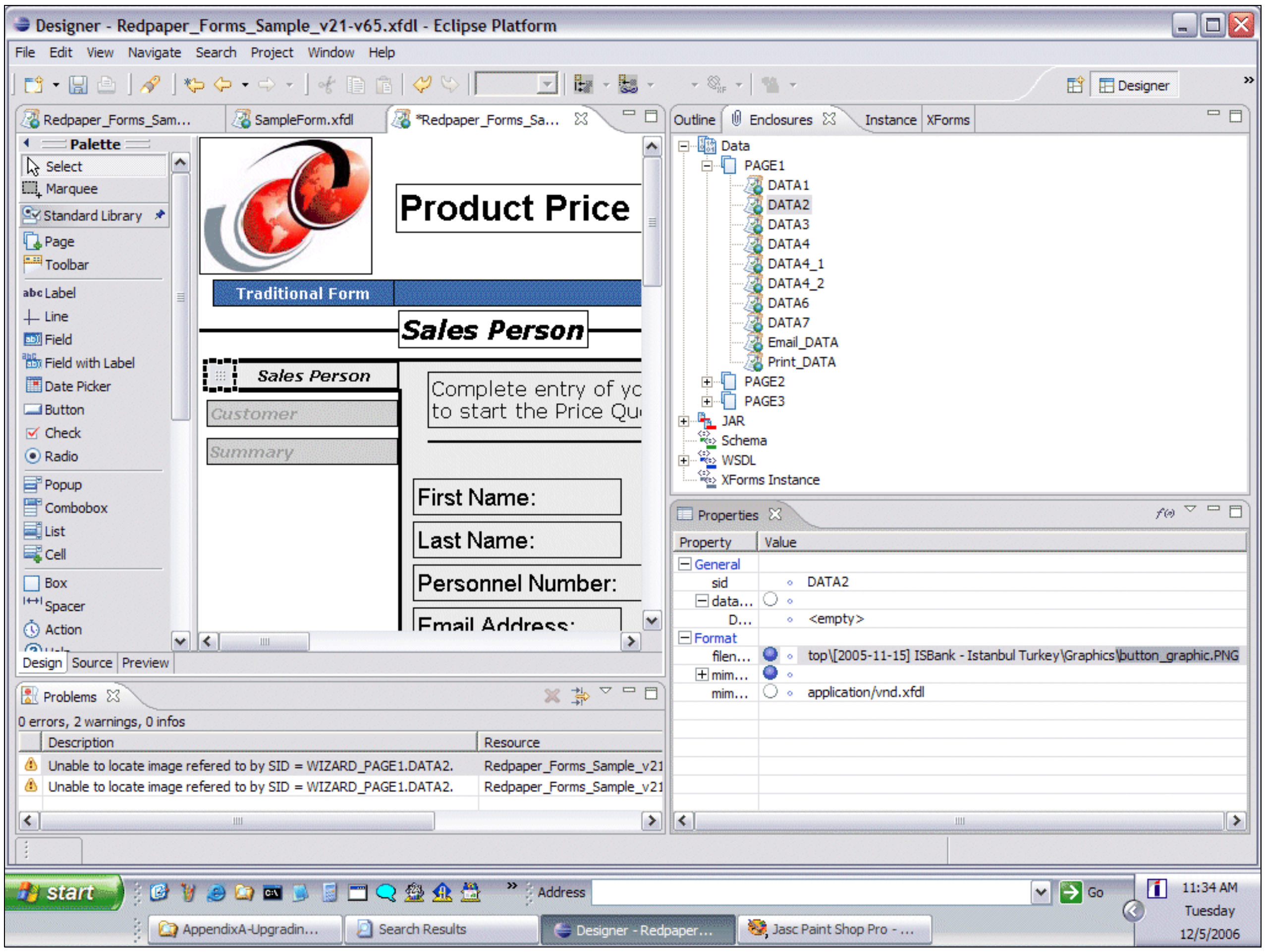
0 errors, 2 warnings, 0 infos

Description	Resource	In Folder
Unable to locate image refered to by SID = WIZARD_PAGE1.DATA2.	Redpaper_Forms_Sample_v21-v65.xfdl	Redbook/Stage3
Unable to locate image refered to by SID = WIZARD_PAGE1.DATA2.	Redpaper_Forms_Sample_v21-v65.xfdl	Redbook/Stage3

Figure A-13 Warning messages in Problems view

In Figure A-13 we see that there is an image file being referenced by a label item for the tabbed navigation.

Go to Enclosures view to see what image file is being referenced, as shown in Figure A-14. If you cannot locate the original file and replace the existing enclosure then it can be removed in some cases.



Problems

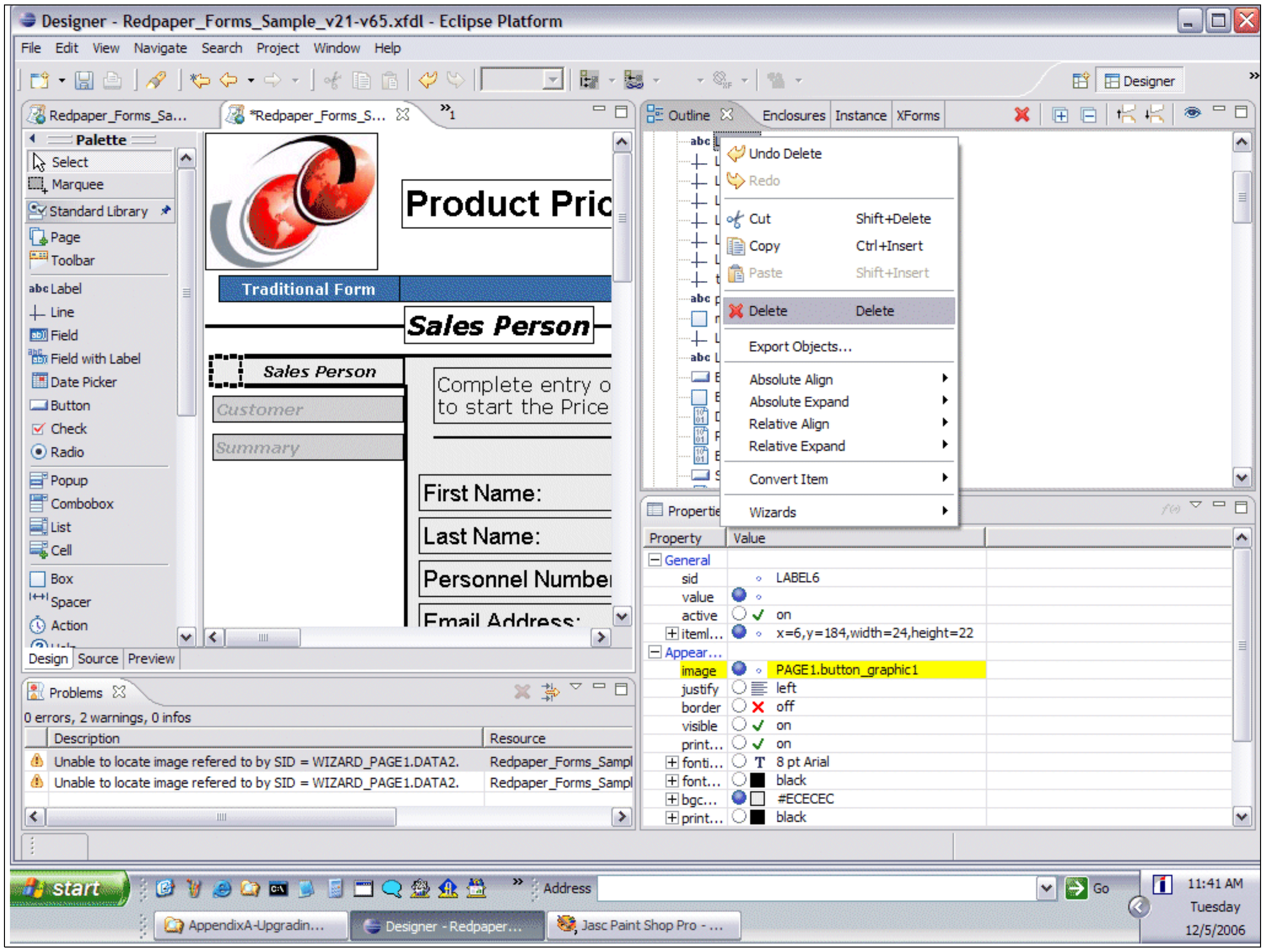
0 errors, 2 warnings, 0 infos

Description	Resource
Unable to locate image refered to by SID = WIZARD_PAGE1.DATA2.	Redpaper_Forms_Sample_v21
Unable to locate image refered to by SID = WIZARD_PAGE1.DATA2.	Redpaper_Forms_Sample_v21

Property	Value
General	
sid	DATA2
data...	
D...	<empty>
Format	
filen...	top\[2005-11-15] ISBank - Istanbul Turkey\Graphics\button_graphic.PNG
mim...	
mim...	application/vnd.xfdl

Figure A-14   Invalid reference to enclosed file

In our sample form, we cannot locate the original file, so we remove the label item completely from our form designer canvas. We do this by selecting the label item from the Outline view, right-clicking, and selecting **Delete** from the popup menu, as shown in Figure A-15.



Problems

0 errors, 2 warnings, 0 infos

Description	Resource
Unable to locate image refered to by SID = WIZARD_PAGE1.DATA2.	Redpaper_Forms_Sampl
Unable to locate image refered to by SID = WIZARD_PAGE1.DATA2.	Redpaper_Forms_Sampl

Properties

Property	Value
General	
sid	LABEL6
value	
active	on
iteml...	x=6,y=184,width=24,height=22
Appear...	
image	PAGE1.button_graphic1
justify	left
border	off
visible	on
print...	on
fonti...	8 pt Arial
font...	black
bgc...	#ECECEC
print...	black

Figure A-15 Delete label

Repeat this process to resolve the remaining warnings in the same manner. It is a best practice in a production environment to either replace or locate the existing file for a production form, if it is possible. For our sample form, we are not bound to the original design, and the most efficient solution is to delete the other items (with missing image files) as well.

B

Writing Form extensions - IFX

This appendix provides a short introduction of custom extensions to the Function Call Interface (FCI) provided by the Forms API. We do not discuss here the full development and deployment path for creating FCI extensions. Rather, we discuss the most relevant use cases for Internet Form Extensions (IFX) and point out additional resources where one can obtain more detailed information about this topic.

In detail, the appendix contains the following:

- A short introduction to the Function Call Interface
- An overview of the most relevant use cases for FCI extensions
- An overview of different deployment methods and the related implications for the functionality of the created FCI extensions and the related XFDL form

Although FCI extensions can be written in Java or C, here we only discuss those written in Java.

Attention: FCI extensions are sometimes also referred to as IFX, short for Internet Form Extension or IBM Form Extension, and is also used for the file extension.

Function Call Interface overview

The Function Call Interface (FCI) API provides a means for creating extremely powerful form applications in a simple and elegant manner. The FCI Library is a collection of methods for developing custom-built functions that form developers may call from XFDL forms. By creating custom functions, you can extend the capabilities of forms without requiring an upgrade to either your forms software or the form description language (XFDL). Using the methods from this library you can:

- Create packages of functions for forms.
- Set up the packages as extensions for Workplace Forms products, such as Viewer or Designer.
- Determine how and when the functions are used. For example, you can specify that a function should run when a form opens, when it closes, and so on.

Custom Function Call Interface extensions can be deployed on the client file system or the Webform Server file system, or they can be embedded in the form.

Note: IFX can be either embedded into the form or installed on the file system. There are benefits and limitations for each approach. Refer to product documentation for detailed information.

The Webform Server can load forms containing embedded FCI extensions, but they will not be executed. FCI extensions deployed to the file system will work in the Viewer or Webform Server respectively with no difference (excepting the obvious cases where there are dependencies on client-side presence).

In general, the areas listed in Table B-1 mainly are supported using custom FCI extensions.

Table B-1 Main purposes to use custom FCI extensions for Workplace Forms

Topic	Comments
Extend functionality of XFDL language creating new, solution-oriented complex functions managing the form.	If the functionality to create is too complex to be managed as XFDL computes, we can code the entire functionality or big parts of them in Java and simply call it from XFDL computes later on.
Integrate with external objects as data sources, external devices, file system, operating system.	Creating IFX we can include in the code any other Java modules to integrate with databases, Web services, authentication devices, specialized output devises as bar code printers, and all functionality of the file system and operating system. Be aware that an FCI extension that is embedded in the form cannot access external objects due to security considerations. As an example, FCI code enclosed in the form cannot access the local file system, but it can submit and receive HTTP transfers such as SOAP Web services and HTTP GET and HTTP POST requests.

Topic	Comments
Tune performance for complex operations in an form.	Accessing the XFDL form using the API, we can manipulate any flags controlling the behavior of the internal computing system. So we can deactivate permanent computing before executing complex operations on the node tree and turn it on after completing the operations. This usually gives an enormous performance boost.
Make the communication with external systems more secure.	Using Java, we can provide here a wide range of security-relevant components as encryption, authentication, and authorization methods not implemented in the Form product.

Creating Function Call Interface extensions

To create an IFX extension, we need to create two classes:

- The extension class
- The FunctionCall class

The other classes available (IFX class and FunctionCallManagerClass) are optional. They can be used to manage multiple extension call classes. For details see the Forms API User Manual. These classes must be packed in a jar file along with a MANIFEST.mf file.

The extension class

The extension class is used to register the newly created functions. Similar to Eclipse plug-in development, the provided code does not create the desired functionality itself. It only allows the later-created functions to register here. When registering, the created modules store the name, parameters, and help information related to the new function, as well as the purpose of each parameter.

When initializing the Viewer or Webform server, the API searches for extension classes and calls the extensionInit method inside the class.

Example B-1 shows an example extension class.

Example: B-1 Simple extension class registering one custom function module (MyFunctionCall)

```
import com.PureEdge.ifx.IFX;
import com.PureEdge.ifx.ExtensionImplBase;
import com.PureEdge.ifx.Extension;
import com.PureEdge.xfdl.FunctionCall;
import com.PureEdge.error.UWIException;
public class FCIAPIExtension extends ExtensionImplBase implements Extension {

   public void extensionInit(IFX theIFX) throws UWIException {

      FunctionCall myFunctionObject = new FCIAPILibrary(theIFX);
   }
}throws UWIException;
```

In most cases, there will be no additional code in this class.

The FunctionCall class

The FunctionCall class contains the functionality to provide with the extension and the related registration code exposing a description of the contained functionality to the extension class.

Example B-2 is an example of a FunctionCall class. It registers a Function Call Interface module containing two available functions and provides the code for these functions.

Example: B-2 FunctionCall class exposing two functions bundled in one module

```
public class FCIAPILibrary extends FunctionCallImplBase implements FunctionCall {

   //Unique Function Call IDs for each function in the library
   /*
    * TODO Declare Function Call IDs Declare one ID for each implemented
    * function call
    */

   //we have 3 functions here
   public static final int FUNCTION_ID1 = 1;
   public static final int FUNCTION_ID2 = 2;
   public static final int DUPLICATETREE = 3;

   //Custom methods
   public FCIAPILibrary(IFX IFXMan) throws UWIException {
      //Define a FunctionCall class constructor that takes as its parameter
      // the IFX Manager.
      FunctionCallManager theFCM;

      //Retrieving the Function Call Manager
      if ((theFCM = IFSSingleton.getFunctionCallManager()) == null)
         throw new UWIException("Needed Function Call Manager");

      //Registering the FunctionCall object with the IFX Manager
      /*
       * TODO Adopt interface registration: Adjust function call version
       * (replace 0x01000300 if necessary)
       */
      IFXMan.registerInterface(this,
            FunctionCall.FUNCTIONCALL_INTERFACE_NAME,
            FunctionCall.FUNCTIONCALL_CURRENT_VERSION,
            FunctionCall.FUNCTIONCALL_MIN_VERSION_SUPPORTED, 0x01000300, 0,
            null, theFCM.getDefaultListener());

      //Registering your packages of custom functions with the Function Call
      // Manager
      /*
       * TODO Adjust function call registration(s)
       * Add a registration call for each implemented function
       */

      //we register a function concatenating 2 strings
      theFCM.registerFunctionCall(this, "sample_package", "Concat",
            FCIAPILibrary.FUNCTION_ID1,
            FunctionCall.FCI_FOLLOWS_STRICT_CALLING_PARAMETERS,
            "S,S", 0x01000300, "Adds two strings");
      //we register a function repeating a string n times
      theFCM.registerFunctionCall(this, "sample_package", "Repeat",
            FCIAPILibrary.FUNCTION_ID2,
            FunctionCall.FCI_FOLLOWS_STRICT_CALLING_PARAMETERS,
            "S,S", 0x01000300, "Repeats a string n times");

      //we register a function duplicating a node structure
      theFCM.registerFunctionCall(this, "FormOperations", "DuplicateTree",
            FCIAPILibrary.DUPLICATETREE,
            FunctionCall.FCI_FOLLOWS_STRICT_CALLING_PARAMETERS, "S,S,S",
            0x01000300, "Duplicates a xfdl subtree as a sibling");

   }

   // evaluate is the method containing the operation code executed on any
   // function call activation within this library. In the method, according to
   // the function call ID
   // different code can run for different function calls implemented.
   public void evaluate(String thePackageName, String theFunctionName,
         int theFunctionID, int theFunctionInstance, short theCommand,
         FormNodeP theForm, FormNodeP theComputeNode,
         IFSUserDataHolder theFunctionData,
         IFSUserDataHolder theFunctionInstanceData, FormNodeP theArgList[],
         FormNodeP theResult) throws UWIException {

      //variables for string functions
      String theType;
      String theString1 = "";
      String theString2 = "";
      int count = 0;
      String result = "";

      //variables for tree duplication
      String theAnswerString = null;
      FormNodeP theSourceNode;
      FormNodeP theTargetNode;
      String theSourceNodeId;
      String theTargetNodeId;
      int pageNo;

      if (theCommand == FunctionCall.FCICOMMAND_RUN) {
         /*
          * Now we’ll switch on the function ID. This makes it easy for a
          * single FunctionCall object to support multiple functions.
          */
         /* This switch is based on theFunctionID that you set for each of
          your custom functions. This makes it easy for a single FunctionCall
          object to support multiple functions. */
         switch(theFunctionID)
         {

         case FCIAPILibrary.FUNCTION_ID1: {
            /***********************************************/
            /* here goes the core code for your function No 1 */
```

```
            /*************************************************/
            theString1 = theArgList[0].getLiteralEx(null); //reads first param
            theString2 = theArgList[1].getLiteralEx(null); //reads 2ns param
            result = theString1 + theString2;
            /* Lastly, we'll store the result in the result node */
            theResult.setLiteralEx(null, result);
            break;
         }
         case FCIAPILibrary.FUNCTION_ID2: {

            /*************************************************/
            /* here goes the core code for your function No 2 */
            /*************************************************/
            theString1 = theArgList[0].getLiteralEx(null);
            theString2 = theArgList[1].getLiteralEx(null);
            count = (int) Integer.parseInt(theString2);
            result = "";
            while (count-- > 0){
               result += theString1;
            }
            /* Lastly, we'll store the result in the result node */
            theResult.setLiteralEx(null, result);
            break;
         }

         case FCIAPILibrary.DUPLICATETREE:{
            /*
             * This method will duplicate any node tree in the XFDL form
             *
             * First, we should grab the string values of the arguments.
             * Since we indicated that this method has three parameters and
             * that it must have these parameters
(FCI_FOLLOWS_STRICT_CALLING_PARAMETERS)
             * when we registered it, we don't have to check to see if we actually
received
             * both parameters. This code won't even be called unless
             * the caller used the right number of parameters.
             */

            //additional code removed here

            theResult.setLiteralEx(null, theAnswerString);
            break;
         }
         }
      }
   }

}
```

Every FunctionCall class consists of the following components:

- One call to the IFXMan.registerInterface method call: This method registers the FunctionCall class to the extension class. So initializing the API, the created FunctionCall is noticed and initiated.

- One or more calls of the theFCM.registerFunctionCall: These calls register the functions provided by this FunctionCall class. This makes them available to the Designer (to create computes containing calls to the provided functions) and also to the run time (Viewer/Webform server) executing these calls.
- The evaluate method: This method allows one to store the working code for the provided functions. Using select statements, we can ascertain the specified function, parse the input parameters, and then execute code containing the corresponding logic.
- An optional method named *help* provides detailed help messages for the parameters provided in the registered functions (note that this is not shown in our example)

Tip: To access parameters passed from the calling XFDL compute into the function, simply refer to the ArgList parameter.

Example B-3 is an example of how one can call a new function via an XFDL compute contained in a form.

Example: B-3 XFDL compute calling the functions available in the created IFX

```
<field sid="FIELD1">

   <!-- additional code removed -->

   <scrollhoriz>wordwrap</scrollhoriz>
   <value compute="sample_package.Concat('string1','string2')">
   </value>
</field>
<field sid="FIELD2">

   <!-- additional code removed -->

   <scrollhoriz>wordwrap</scrollhoriz>
   <value compute="sample_package.Repeat('string1','5')">
   </value>
</field>
```

Note: To call the created functions, always use the attributes (package, function name, parameters) as defined in theFCM.registerFunctionCall method (not the package name or the created Java class as stored in the MANIFEST.mf file).

The parameter FunctionCall.FCI_FOLLOWS_STRICT_CALLING_PARAMETERS ensures that all specified parameters are present. For details see the *JAVA API User Manual.*

The MANIFEST.fm file

The MANIFEST.mf file is mandatory. If must contain the Name: entry specifying the contained FCIExtension class with path and the line:

```
IFS-Extension: True
```

See Example B-4.

Example: B-4 Example manifest file

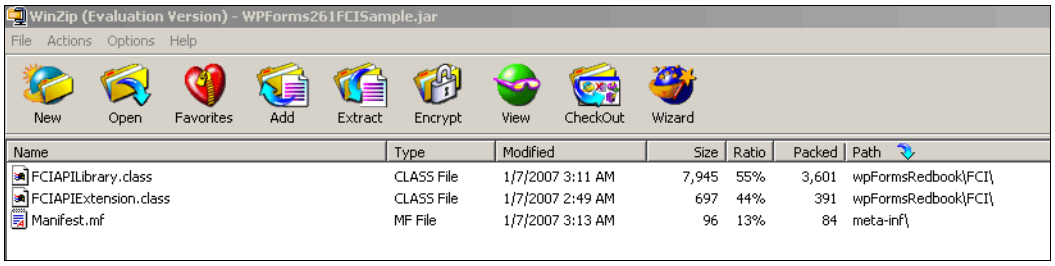
```
Manifest-Version: 1.0

Name: wpformsRedbook/FCI/FCIAPIExtension.class
IFS-Extension: True
```

Deploying Function Call Interface extensions

There are four steps to deploy a new FCI extension:

1. Compile the created classes.
2. Create a special manifest file for the package (named MANIFEST.fm. For details see product documentation.). It is important to include specific settings in the manifest.
3. Create a jar file from the manifest file and the compiled classes. Copy the class file to the file system (client or server) in the Extensions folder of your product (you will find these already the extension classes used by the product by default as the viewer.ifx for the viewer).
4. Restart the component to that we deployed the new FCI extension. It will load it on API initialization.

The created jar file should look like Figure B-1.



Name	Type	Modified	Size	Ratio	Packed	Path
FCIAPILibrary.class	CLASS File	1/7/2007 3:11 AM	7,945	55%	3,601	wpFormsRedbook\FCI\
FCIAPIExtension.class	CLASS File	1/7/2007 2:49 AM	697	44%	391	wpFormsRedbook\FCI\
Manifest.mf	MF File	1/7/2007 3:13 AM	96	13%	84	meta-inf\

Figure B-1 Structure of an simple FCI JAR file

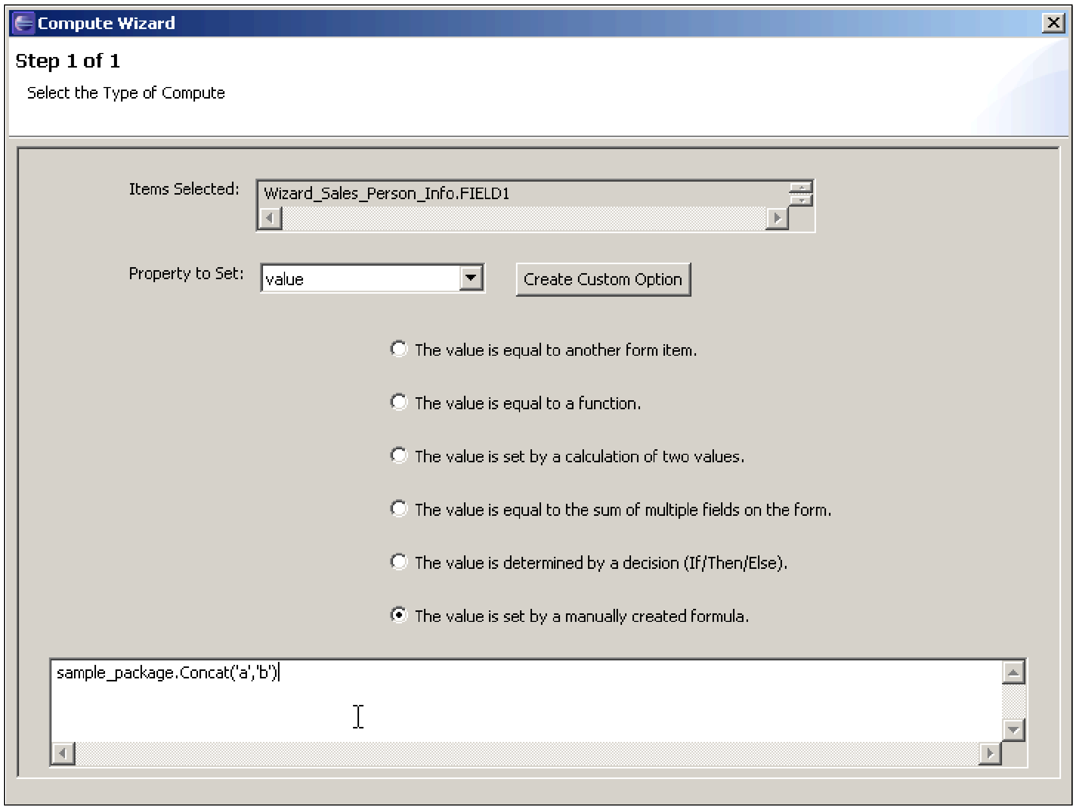
We also have the option of enclosing the created jar file into the form. This approach, however, has the following implications:

- There is no need for local deployment on the clients.
- The size of the form can be impacted in significant ways for certain IFXs.
- The provided functionality will not be available on the Webform Server. The form loads, but the IFX code will not be executed.
- For security reasons, the JVM will not give the embedded code in the form access to the local system.
- The enclosed FCI extension is initiated on form load, not on viewer load.

For deployment details see IBM Workplace Forms 2.6.1 Product documentation package *IBM Workplace Forms Server — API Installation and Setup Guide*.

Calling Function Call Interface Extensions in XFDL computes

Calling a FCI extension in an the XFDL compute involves some manual steps. As of the 2.61 release, the created functions do not show up in the Designer XFDL compute wizard function list. We can see in Figure B-2 that only the standard functions contained in the Viewer package, system package, and XForms package. For Designer Versions 2.6 and 2.6.1, product documentation recommends using the option for manually created computes.



Items Selected: Wizard_Sales_Person_Info.FIELD1

Property to Set: value

( ) The value is equal to another form item.
( ) The value is equal to a function.
( ) The value is set by a calculation of two values.
( ) The value is equal to the sum of multiple fields on the form.
( ) The value is determined by a decision (If/Then/Else).
[✓ The value is set by a manually created formula.]

```
sample_package.Concat('a','b')
```

Figure B-2 Creating a compute containing an FCI function from the example code

In Designer 2.5 there is full support to custom FCI functions. This support should be available in an upcoming Designer version. Opening a wizard to create computes, after registering a custom IFX, in the designer exposed just one or more package names in the package selection list (Designer Version 2.5). By default, we saw there the system package and the Viewer package. Selecting the newly created package, in the next selection all registered functions showed up along with the available helper descriptions for the parameters.

Debugging Function Call Interface extensions

There are two hurdles to utilize FCI extensions:

- We must make sure that they are loaded.
- They must execute the correct functionality.

For both challenges there are different debugging methods.

Debugging API/FCI extension loading

On a Windows system, create in the C:\ directory a text file named pureedge.pel. If this file exists, every forms product running on the machine will start to create log files in the C:\ directory (Viewer, applications using the API, Webform Server, embedded Viewer in a browser — everything that used any part of the Forms product, except the Forms Designer 2.6.x).

Inspect these logs for the API installation. Here we can find lots of information about:

- The search procedures for the PureEdgeAPI.INI file
- The modules declared in the found PureEdgeAPI.INI files
- The search procedures executed to find IFX extensions
- The modules found and loaded in these extensions
- The JVM used to run the API

To test a created FCI.jar file, deploy it to the extensions folder in the Viewer install directory and launch the Workplace Forms Viewer. The masqform.log file should show the related trace lines for the FCI extension load (or any errors).

Example: B-5 Fragment for Masqform.log file tracing the FCI function library load

```
0070106T184008.968+0100 1068 DLL_THREAD_ATTACH

20070106T184009.968+0100 488 Attaching thread 0106feb8 to error system 01e97458

20070106T184009.968+0100 488 Suspending thread 0106feb8 from error system 0106fbc8
on error system 01e97458 behalf

20070106T184009.984+0100 488 JNIBRIDGE: Adding entry to table. UWIObject=01E98350

20070106T184009.984+0100 488 API: Loading Java IFX:
C:\IBM\Forms\Viewer261\extensions\WPForms261FCISample.jar

20070106T184010.218+0100 488 JNIBRIDGE: Adding entry to table. UWIObject=01E9AC38

20070106T184010.218+0100 488 API: Finished looking for Java IFX's in
C:\IBM\Forms\Viewer261\extensions

20070106T184010.218+0100 488 Request to release reference ignored -
com.uwi.ifx.IFX 0x4FA728 is not a reference counted object!

20070106T184010.218+0100 488 API: Completed looking for extensions in
C:\IBM\Forms\Viewer261\extensions

20070106T184010.265+0100 488 Initializing IBM(R) Workplace Forms(tm) Viewer

20070106T184010.312+0100 488 CURLResolver::Init

20070106T184010.312+0100 488 CViewerFrame::OnCr
```

Attention: Do not forget to remove the pureedge.pel file after testing. Otherwise your log files created will grow rapidly.

Debugging Java code running inside a built IFX using Eclipse/RAD6

To debug IFX code, we can use Java remote debugging. For setup details, search your Java development environment (that is, in the Eclipse help module). To use this approach in conjunction with the IBM Workplace Forms Server API:

1. Create the jar file for the IFX and deploy it to the file system.
2. Prepare Workplace Forms Viewer for remote debugging.
   a. Open the file <UserHome>\Application Data\PureEdje\Viewer7.0\prefs\prefs.config (<UserHome> is located in C:\Documents and Settings\<WinUsername>). If the file is missing, create a new, empty text file.

   Tip: Modifying the Viewer settings (for example, changing the print configuration) will create this file automatically for you.

   b. Insert/edit in the file the lines in Example B-6.

Example: B-6 Contents of prefs.config file for remote debugging

```
######################Java remote debugging START #######################
#assign a dedicated JVM if necessary
#javaPath = C:\eclipse\IBMJDK142\jre\bin\classic\jvm.dll
#assign a parent to select one of the available JVMs
#javaVM = IBMJDK142
#ATTENTION: -X options may vary depending on the JVM !!!
#  activate debugging
jvmOptions.1 = -Xdebug
#  Disable support for oldjdb debugger
jvmOptions.2 = -Xnoagent
#  disable the JIT
jvmOptions.3 = -Djava.compiler=NONE
#  apply remote debug options
#     'address=8800' causes the JVM to listen on that port for a debugger.
#     'suspend=n' allows the JVM to start and run even if there is no debugger.
#     apply 'suspend=y' to make the JVM will stopping immediately (which will hang
the Viewer until the debugger attaches -- this is useful for debugging
initialization code).
jvmOptions.4 = -Xrunjdwp:transport=dt_socket,server=y,suspend=n,address=8800
######################Java remote debugging END #######################
```

   c. Save the file.
3. Set up the Eclipse debug configuration:
   a. Go to the debug pull-down (click the down arrow to the right of the bug in the Debug perspective).
   b. Click **Debug**.
      i. In the Debug (Create, manage, and run configurations) popup, click **Remote Java Application** in the configurations.
      ii. Click **New**.
   c. On the Connect tab, fill in the project name. Use Connection Type: Standard (Socket Attach).
      i. In Connection Properties use host `localhost` and port `8800`.
      ii. Click **Apply** and **Cancel** to save it and get out.

4. Start the Viewer (the one using your Java extension). Wait a moment until the Viewer hangs on the splash screen (if you have suspends) or after the form comes up (if you have suspending).
5. We can start the debug session now. (If there is any question about the JVM properly starting to listen for debugging on port 8800 or whatever port you use, try: netstat -an [on windows or Linux®], look for port 8800 LISTENING.)
6. The debugger should say that it has connected. You should see the threads that are running. Click a thread and click **Suspend**. Or set break points and cause that code to be run.

Additional resources for IFX/FCI extension

For detailed information about the FCI background, functionality of Java-based FCI extensions, and some sample code, see the IBM Workplace Forms 2.6.1 Product, documentation package *IBM Workplace Forms Server - API - JAVA API User's Manual*.

For similar material related to C see the IBM Workplace Forms 2.6.1 Product, see the documentation package *IBM Workplace Forms Server - API - C API User's Manual*.

Information about the installation procedures for created FCI extensions are available in IBM Workplace Forms 2.6.1 Product, documentation package *IBM Workplace Forms Server — API Installation and Setup Guide*.

C

Web services

In this appendix we discuss various considerations regarding Web services in Workplace Forms, including:

- Web services integration
- Common scenario for Web services in Forms
- Web service development
- Web service runtime
- Implementing Web services in XForms

Web services integration

Web services integration in a Workplace Forms context is a specific way to dynamically get hold of content-specific data (such as custom options for a selected object) or real-time data that changes during the time spent working in the form (such as actual stock prices or exchange rates). A Web service integration (for simple cases, which make up more than 90% of all Web service use cases) is a simple task to do, since there are efficient tools available to support Web service development and implementation.

In a global context, Web services are a convenient method for data exchange between different systems. In most cases, we find a *request/response* use case. The Web service consumer submits a request to the provider, and the provider sends a response back. This works regardless of platform, operating system, and programming languages of both the service provider and the service consumer, because the used transmission protocol and internal data structure of the request and response are defined in an independent format, the *Web Service Description Language (WSDL)*.

Web service integration targets the form development (implementing the Web service calls in XFDL structure) and the service provider (usually an http/soap proxy server connected to the data source). The developed modules are not necessarily related to the application server dealing with the forms handling. That is why the created provider code is not included in the Forms application but is available as separate standalone applications ready to run on different servers.

Common scenario for Web services in Forms

The Workplace Forms Viewer contains a built-in Web service consumer. The consumer is configured by a WSDL contained in the launched form. Usually this WSDL is included in design time, but it can be changed all throughout the form's life cycle. By calling a Web service, the Workplace Forms Viewer reads the WSDL and configures the request message to send and analyze the incoming response according to the actual Web service description included in the form. These capabilities suggest the usage of the Workplace Viewer as Web service consumer and the creation of the Web service provider for the server maintaining back-end data.

We use Web services to retrieve data from back-end systems. It is possible to write back data as well, but in this book we do not implement those services. The way of implementation would be the same for both cases. Only the meaning (and amount) of data transmitted in both directions would vary (see Table C-1).

Table C-1 Web service data flow

	Data retrieval Web service	Data submission Web service
Request	No data, one or more parameters for data selection	One or more submitted fields and a record selection
Response	One or multiple retrieved objects	Simple response (OK/NOK) or extended transaction information as logs, created IDs, processed data. and so forth.

There are many different approaches to define the internal data structure of a request:

- Service style (document, document-wrapped, or RPC)
- Encoding (encoded or literal)

Depending on the chosen style for the service, objects of different structures can be declared. When we implement Web services for the Workplace Forms Viewer, we have to match the following restrictions:

- Web services must not include the underscore character (_) in either service or port names, but can include it in operation names.
- Web services must not use mandatory headers, as defined by the soap:mustUnderstand tag name.
- Web services are restricted to the 46 primitive data types as defined by schema. Third-party extensions to the primitive data types are not supported.
- Web services may use basic or digest authentication. In either case, authentication must be performed before calling any functions in the Web service. This is accomplished by calling the setNetworkPassword function, which is created in a package with the same name as the Web service.
- In Workplace Forms V2.6.1, SSL is supported in XForms. A Web services call is done using the XForms submit or send function, which submits an XML instance to the Web service, which then returns an instance.

  Note: When using Web services with XForms, the SSL support should not use mutual authentication if using the Webform Server, since the Webform Server does not support any type of authentication, only the encryption function of SSL.

Some of the constrains above (authentication type, basic types only, naming conventions) have to be considered when connecting to an existing Web service. Missing SSL support will give hard limitations to the sensibility of transferred data.

Note: These restrictions apply only to the built-in Web service implementation. However, we can develop Web service consumers with other profiles and include them as a Java library in a custom IFX extension (written in Java or C). These extensions can be called from XFDL computes as additional function libraries.

Finally, we create three Web services (for each of the three potentially used object types, one dedicated Web service) with five service methods (Table C-2).

Table C-2 List of implemented Web service operations

Object (Web service description file)	**Operation name**	**Purpose**
Employee data (EmployeeInfo.wsdl)	GETEMPLOYEEINFO	Gathering employee detail data based on employee number. Returns a complex object with detail data. Not used in the project, since employee data was finally added to the form as prepopulation not using a Web service.
Customer data (CustomerInfo.wsdl)	GETCUSTINFO	Gathering customer detail data based on customer number. Returns a complex object with detail data. Activated on any change in customer selection field.
	GETCUSTOMERLIST	Imports complete customer list (name and customer account number) as a single string. Activated on first form load.

Object (Web service description file)	Operation name	Purpose
Product data (ProductInfo.wsdl)	GETPRODUCTINFO	Gathering product detail data based on item number. Returns a complex object with detail data. Activated on any change in an item selection field.
	GETPRODUCTLIST	Imports complete product list (name and product number) as a single string. Activated on first form load.

Web service development

Even though this appendix focuses on Web service based integration with a J2EE-based environment, we begin to see and realize the eventual consequences for the Domino integration scenario discussed in Chapter 9, "Lotus Domino integration" on page 493. The main reason is to define the Web services implementation in a way that is usable for both environments with no changes or only a minimum of changes in the created form.

Very often the development tools used make up additional constraints to the concrete implementation. As a Web service provider, we select Tomcat 5.0 to gather data from a DB2 server (J2EE integration scenario) and Domino 7.0 Server (Domino integration scenario). As Web service development tools for these platforms, in this book we use IBM Rational Application Developer Version 6 (RAD6) and Domino Designer Version 7.0.

Web service development can be done following one of two strategies:

- Bottom up: Create a WSDL description of a Web service based on a given class or data structure.
- Top down: Create a skeleton of classes and data objects based on a given WSDL description.

In the project we use both techniques. Due to the project target — show an integration scenario using WebSphere Application Server (WAS)/Portal and a complementary scenario using Domino — we have to implement two Web server providers for each service. The idea is to implement a service in one environment bottom-up, and based on the generated WSDL file, implement the second provider top-down. This should ensure that we can use the same form (the same Web service consumer) in both environments.

We always start building a class in Domino Designer, export the WSDL to RAD 6, and implement the complementary service provider using Java for the WebSphere Application Server (WAS)/Portal environment. The reason for starting with Domino is that we had the required classes in Domino available. There is no hard stop to do the work starting with J2EE and RAD6.

The reason for starting bottom-up is simple: defining a valid WSDL for a Web service manually is very demanding work, which can be done for simple objects much better using a tool with bottom-up capabilities.

Figure C-1 shows the development road map used in the book project.

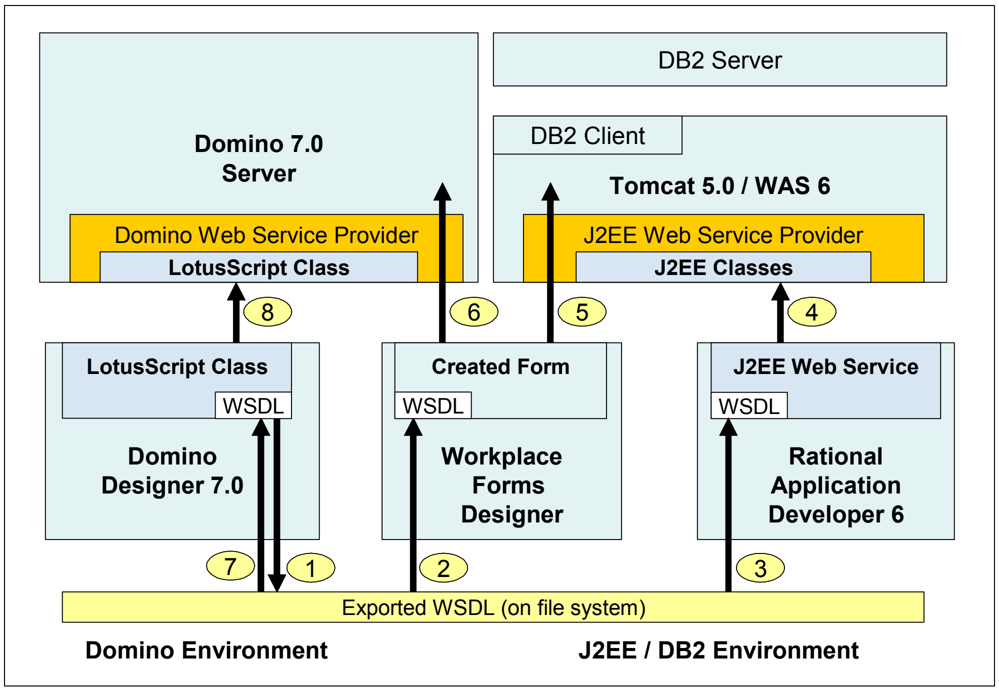


Figure C-1 Architecture of Web service design (development roadmap)

Thee steps shown in Figure C-1 are:

1. Create the object class definition and WSDLexport to file system. Make cosmetic changes (such as eliminating Domino from any names used in the WSDL file).
2. WSDL import to Workplace Forms Designer (Tools/Enclose WSDL) and coding for Web service invocation in the XFDL form and create a function calling the service.
3. WSDL import to RAD 6 and J2EE Web service provider/test client development.
4. Deployment of Web service consumer as a J2EE application (WAR file) to WebSphere Application Server (WAS)/Tomcat server.
5. Deployment of developed form as template to WebSphere Application Server (WAS) server file system to make it available to the J2EE integration scenario.
6. Deployment of developed form as template to Domino database to make it available to Domino Integration scenario (Chapter 9, “Lotus Domino integration” on page 493).
7. Re-import the generalized WSDL and do the necessary Lotus Script development in the created class skeleton (the top-down approach).
8. Deployment of the Web service to Domino server (which is automatically available, when the development template resides on an http-enabled Domino server).

Web service development in Forms Designer is limited to three rather basic actions using the WSDL created in step 2 (include WSDL in the form, create a XFDL function call to invoke the service with a specified target for the response object and data retrieval from the received response object). Using the built-in Web service consumer, there is no need (and no chance) for additional coding in low-level procedures. For details on the necessary steps, see Chapter 2, “Features and functionality” on page 19.

For details on how to create Web service providers in Domino, see the chapter “Programming Domino for Web Applications/Web services” in *Domino 7.0 Designer Help*.

For details on how to create Web services in RAD6, see *Eclipse Help in RAD6*. Choose **Help/Help Contents** from the menu and select the chapter **Developing Web services**.

The main steps for RAD6 are as follows:

1. Create a new Dynamic Web Project.
2. Import a WSDL to the project root.
3. Right-click the WSDL and choose **Web Services/Generate Java Bean skeleton**.
4. Select **Generate a proxy** and **Create Test Client** (optional, but recommended).
5. Click **Finish**.
6. Search for the .....SoapBindingImpl.java file in the <project>/JavaResources/JavaSource/<your package> folder.
7. Edit the generated class skeletons to create the desired return object.

See Example C-1 and Example C-2 for the coding involved.

Example: C-1 Empty class skeleton after creation in file ProductCatalogPortSoapBindingImpl.java

```
/**
 * ProductCatalogPortSoapBindingImpl.java
 *
 * This file was auto-generated from WSDL
 * by the Apache Axis WSDL2Java emitter.
 */

package WPFormsRedpaper;

import forms.cam.itso.ibm.com.DB2ConnectionForms;

public class ProductCatalogPortSoapBindingImpl implements
WPFormsRedpaper.ProductCatalogPortType{
    public java.lang.String GETPRODUCTLIST(java.lang.String FILTER) throws
java.rmi.RemoteException {
     return null;
    }

    public WPFormsRedpaper.PRODUCT GETPRODUCTINFO(java.lang.String IT_ID) throws
java.rmi.RemoteException {
   return null;
    }

}
```

Example: C-2 Web service implementation after completing with implementation code

```
/**
 * ProductCatalogPortSoapBindingImpl.java
 *
 * This file was auto-generated from WSDL
 * by the Apache Axis WSDL2Java emitter.
 */

package WPFormsRedpaper;

import forms.cam.itso.ibm.com.DB2ConnectionForms;

public class ProductCatalogPortSoapBindingImpl implements
WPFormsRedpaper.ProductCatalogPortType{
    public java.lang.String GETPRODUCTLIST(java.lang.String FILTER) throws
java.rmi.RemoteException {
    String prodList = DB2ConnectionForms.getInventoryList();
        return prodList;
    }

    public WPFormsRedpaper.PRODUCT GETPRODUCTINFO(java.lang.String IT_ID) throws
java.rmi.RemoteException {
    WPFormsRedpaper.PRODUCT it = new WPFormsRedpaper.PRODUCT();
    String[] itemData = DB2ConnectionForms.getInventoryItemData(IT_ID);
    it.setIT_ID(itemData[0]);
    it.setIT_NAME(itemData[1]);
    it.setIT_PRICE(Double.valueOf(itemData[2]).doubleValue());
    it.setIT_STOCK(Integer.valueOf(itemData[3]).intValue());
    return it;
    }
}
```

Creating Web services for Tomcat 5.0 and WebSphere Application Server (WAS) 6.0, we can use all default settings proposed by RAD6. Developing for WebSphere Application Server (WAS) 5.1, however, we have to manually set the target protocol to *Apache AXIS 1.0* protocol (*IBM SOAP* and *IBM WebSphere protocol* did not accept the created WSDL files). Nevertheless, the generated classes do not compile to acceptable results, since they do not contain suitable serializers/deserializers for the created classes.

This problem can be resolved only by extended debugging of the generated code or a redefinition of the used WSDL (such as implementing a Web service using another style, encoding, or object structure). As a result, in the project, the Web services are generated for WebSphere Application Server (WAS) 6/Tomcat 5 using the initial WSDL files and deployed on the Tomcat 5.0 server coming with the IBM Workplace Forms Server on the same machine as WebSphere Application Server (WAS) 5.1.

For the demonstration of Forms and Web service integration capabilities, a main goal is to reuse the same WSDL description for different Web service providers. The minimum change required to make a Web service running in different environments is the adjustment of the Web service endpoint definition (URL and port to the target Web service provider).

Forms implementation does not provide a dedicated functionality to change parts of WSDL information, but this can be done using different techniques outside XFDL language and API (such as text parsing and/or Forms API methods) in different phases of a forms life cycle:

- In design time (before importing the WSDL file to Workplace Form in Workplace Forms Designer) — We use this approach for the J2EE/DB2 integration scenario to switch the URL from default URL (`http://localhost`) to the target URL of the J2EE Web service provider just after WSDL export to file system.
- In deployment time (when storing the form to the template repository in the production system) — not used in this project.
- In runtime (for example, just before template download to the Forms Viewer as a part of form prepopulation) — We use this approach in the Domino environment.

Additionally, we edit the WSDL, changing some internal names and namespace containing the original source platform (Domino) before beginning any Web service development. These names were changed to a project-related name such as WPFormsRedpaper.

An important note for development is to check the tolerance of all involved systems to the structure of the deployed WSDL and the structure of the exchanged soap messages. We have to make minor adjustments to the WSDL before importing to RAD6 (removing some empty structures in type definitions), but this step can cause a complete rework of the Web service definition in other projects. Processing the full development cycle for one target system without a compatibility check with all other potential components involved can be risky.

Web service runtime

Having all components created, we can deploy the components to the different systems and run a first test.

Figure C-2 shows data flow during runtime. Web services are called in our sample form directly after first form load (reading choices lists for customers and products from the repository) and during work in the form (gathering detail data after selecting a product or customer). For each Web service, call activities 2–8 are processed.

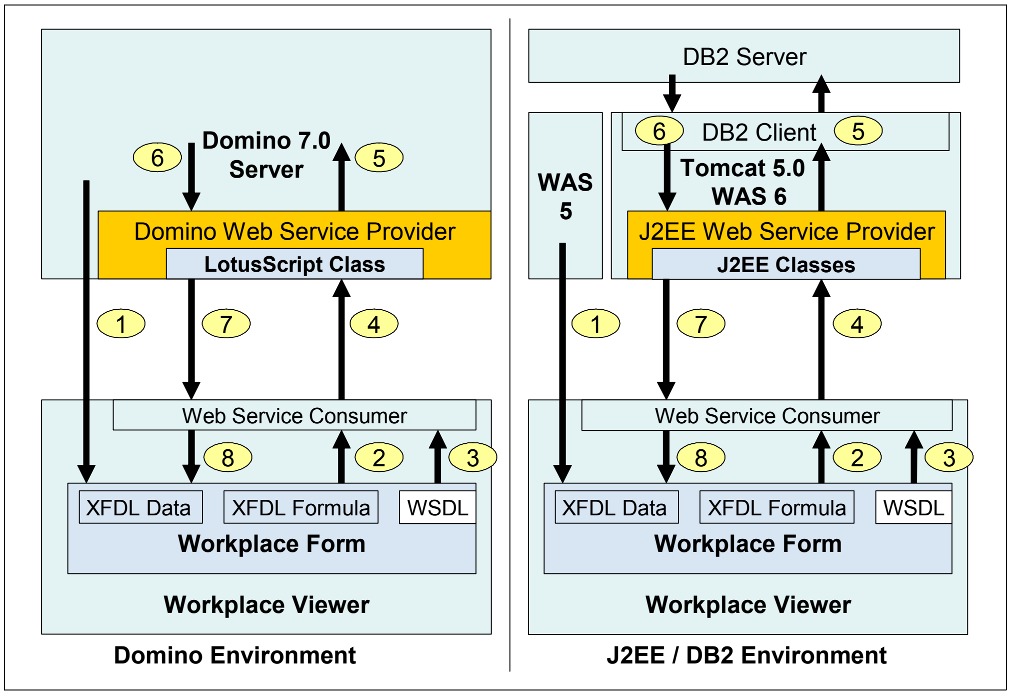


Figure C-2 Runtime Web service activities (data flow)

Figure C-2 shows the following steps for both the J2EE and the Domino environments:

1. Form download (with or without value prepopulation initiated on the server side)
2. Web service invocation by a XFDL formula (on first load or any other form events, like a button clicked, or a value change in a field), including transfer on all input parameters for this request
3. Web service consumer pre-configuration according to the selected WSDL (target URL, message structures)
4. Compose and submit request (done by built-in Web service client), Web service request parsing on Web service provider (WebSphere Application Server (WAS) or Domino)
5. Data query to target source (DB2 or Domino) coded in the J2EE or Lotus Script classes on provider side
6. Data retrieval form data source (DB2 or Domino) coded in the J2EE or Lotus Script class on provider side

7. Response message composition on provider side, decomposition in Forms Viewer Web service consumer
8. Data storage to the target specified in the initiating Web service invocation function executed in step

As a Web service target to store the response object, XFDL can assign only values to one single object. If the response contains a complex object, it overwrites the assigned target XFDL node with the content of the response message. This can (and will) locally change the structure of the XFDL document if the initial structure for the target is not the same as in the incoming message (changed number, order, names of child elements, additional attributes, and missing or additional XML subtrees are possible). That is why a best practice is to inspect and double-check not only the Web service description but also the incoming responses from the provider. Different providers can create differently structured response message structures based on identical WSDLs and incoming messages.

This happens, for example, when switching between a Domino-based and a J2EE-based Web service provider. Example C-3 shows customer data as one complex object containing eight elements (CUST_ID, CUST_NAME, CUST_AMGR, and some others).

Example: C-3 Extract from WSDL for CustomerInfo object

```
.....
<wsdl:types>
  <schema xmlns="http://www.w3.org/2001/XMLSchema"
     targetNamespace="http://WPFormsRedpaper">
   <import namespace="http://schemas.xmlsoap.org/soap/encoding/"/>
   <complexType name="CUSTOMER">
    <sequence>
     <element name="CUST_ID" type="xsd:string"/>
     <element name="CUST_NAME" type="xsd:string"/>
     <element name="CUST_AMGR" type="xsd:string"/>
     <element name="CUST_CONTACT_NAME" type="xsd:string"/>
     <element name="CUST_CONTACT_POSITION" type="xsd:string"/>
     <element name="CUST_CONTACT_PHONE" type="xsd:string"/>
     <element name="CUST_CONTACT_EMAIL" type="xsd:string"/>
     <element name="CUST_CRM_NO" type="xsd:string"/>
    </sequence>
   </complexType>
  </schema>
 </wsdl:types>
 <wsdl:message name="GETCUSTINFORequest">
  <wsdl:part name="CUST_ID" type="xsd:string"/>
 </wsdl:message>
 <wsdl:message name="GETCUSTINFOResponse">
  <wsdl:part name="GETCUSTINFOReturn" type="impl:CUSTOMER"/>
 </wsdl:message>
<wsdl:portType name="CustomerInfo">
.....
<wsdl:operation name="GETCUSTINFO" parameterOrder="CUST_ID">
   <wsdl:input message="impl:GETCUSTINFORequest" name="GETCUSTINFORequest"/>
   <wsdl:output message="impl:GETCUSTINFOResponse" name="GETCUSTINFOResponse"/>
  </wsdl:operation>
 </wsdl:portType>
....
```

The corresponding data instance in XFDL form intended to receive the Web service response message containing the employee data looks like Example C-4.

Example: C-4 XFDL data instance in form template containing CustomerInfo object

```
<xforms:instance xmlns="" id="FormCustomerData">
 <GETCUSTINFOResponse>
    <GETCUSTINFOReturn>
       <CUST_ID></CUST_ID>
       <CUST_NAME></CUST_NAME>
       <CUST_AMGR></CUST_AMGR>
       <CUST_CONTACT_NAME></CUST_CONTACT_NAME>
       <CUST_CONTACT_POSITION></CUST_CONTACT_POSITION>
       <CUST_CONTACT_PHONE></CUST_CONTACT_PHONE>
       <CUST_CONTACT_EMAIL></CUST_CONTACT_EMAIL>
       <CUST_CRM_NO></CUST_CRM_NO>
    </GETCUSTINFOReturn>
 </GETCUSTINFOResponse>
</xforms:instance>
```

This structure exactly reflects the estimated response object including message name and operation name (GETCUSTINFOResponse and GETCUSTINFOReturn). The incoming message from Domino looks like Example C-5.

Example: C-5 Response message sent by Domino Web service provider

```
<?xml version="1.0" encoding="UTF-8"?>
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:soapenc="http://schemas.xmlsoap.org/soap/encoding/">
 <soapenv:Body>
  <ns1:GETCUSTINFOResponse
soapenv:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/"
xmlns:ns1="http://WPFormsRedpaper">
  <GETCUSTINFOReturn xsi:type="ns1:CUSTOMER"><CUST_ID
xsi:type="xsd:string">100001</CUST_ID>
    <CUST_NAME xsi:type="xsd:string">XXX</CUST_NAME>
    <CUST_AMGR xsi:type="xsd:string">1001</CUST_AMGR>
    <CUST_CONTACT_NAME xsi:type="xsd:string">Mr. Last</CUST_CONTACT_NAME>
    <CUST_CONTACT_POSITION xsi:type="xsd:string">tester</CUST_CONTACT_POSITION>
    <CUST_CONTACT_PHONE xsi:type="xsd:string">PH</CUST_CONTACT_PHONE>
    <CUST_CONTACT_EMAIL xsi:type="xsd:string">xx@xxx</CUST_CONTACT_EMAIL>
    <CUST_CRM_NO xsi:type="xsd:string">200001</CUST_CRM_NO></GETCUSTINFOReturn>
  </ns1:GETCUSTINFOResponse>
 </soapenv:Body>
</soapenv:Envelope>
```

The J2EE-based Web service provider on the same request returns messages as shown in Example C-6.

Example: C-6 Response message sent by J2EE Web service provider

```
<?xml version="1.0" encoding="UTF-8"?>
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
 <soapenv:Body>
```

```
  <ns1:GETCUSTINFOResponse
soapenv:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/"
xmlns:ns1="http://WPFormsRedpaper">
   <GETCUSTINFOReturn href="#id0"/>
  </ns1:GETCUSTINFOResponse>
  <multiRef id="id0" soapenc:root="0"
soapenv:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" xsi:type="ns2:CUSTOMER"
xmlns:soapenc="http://schemas.xmlsoap.org/soap/encoding/"
xmlns:ns2="http://WPFormsRedpaper">
   <CUST_ID xsi:type="xsd:string">100001</CUST_ID>
   <CUST_NAME xsi:type="xsd:string">Workplace Early Adopter Inc</CUST_NAME>
   <CUST_AMGR xsi:type="xsd:string">1000</CUST_AMGR>
   <CUST_CONTACT_NAME xsi:type="xsd:string">Mary F Thompson</CUST_CONTACT_NAME>
   <CUST_CONTACT_POSITION xsi:type="xsd:string">DeptMgr</CUST_CONTACT_POSITION>
   <CUST_CONTACT_PHONE xsi:type="xsd:string">1 756-568-123</CUST_CONTACT_PHONE>
   <CUST_CONTACT_EMAIL
xsi:type="xsd:string">Mary.F.Thompson@Workplace-Early-Adopter.com</CUST_CONTACT_EMAIL>
   <CUST_CRM_NO xsi:type="xsd:string">200002</CUST_CRM_NO>
  </multiRef>
 </soapenv:Body>
</soapenv:Envelope>
```

The significant differences between both messages are shown in *italics*. The operation contains a reference to the object only. The object is then attached as a multiRef element. Creating those messages is a valid behavior commonly used to create messages (potentially) containing circular references between objects. This is not the case in our example, but in the result, the data instance in the XFDL form changes after a Web service call to a J2EE provider like Example C-7.

Example: C-7 Changed data instance structure after J2EE Web service call

```
<xforms:instance xmlns="" id="FormCustomerData">
  <GETCUSTINFOResponse>
     <multiRef xmlns:ns2="http://WPFormsRedpaper"
xmlns:soapenc="http://schemas.xmlsoap.org/soap/encoding/"
xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" id="id0" soapenc:root="0"
soapenv:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" xsi:type="ns2:CUSTOMER">
        <CUST_ID xsi:type="xsd:string">100002</CUST_ID>
        <CUST_NAME xsi:type="xsd:string">Portal Application Surfacing</CUST_NAME>
        <CUST_AMGR xsi:type="xsd:string">1001</CUST_AMGR>
        <CUST_CONTACT_NAME xsi:type="xsd:string">Hiu Kwan</CUST_CONTACT_NAME>
        <CUST_CONTACT_POSITION xsi:type="xsd:string">Director</CUST_CONTACT_POSITION>
        <CUST_CONTACT_PHONE xsi:type="xsd:string">+43 623-644</CUST_CONTACT_PHONE>
        <CUST_CONTACT_EMAIL
xsi:type="xsd:string">Hiu.Kwan@p-app.surf.org</CUST_CONTACT_EMAIL>
        <CUST_CRM_NO xsi:type="xsd:string">200003</CUST_CRM_NO>
     </multiRef>
  </GETCUSTINFOResponse>
</xforms:instance>
```

The outcome is a changed tag name (<GETCUSTINFOReturn> to <multiRef>) that must be considered as creating bindings to the inner structure of the object.

Working with XML data instances, the workaround used is relative addressing of any inner elements and making code tolerant to changes of the relevant tags:

[GETCUSTINFOResponse][0][CUST_ID].value

In place of:

```
[GETCUSTINFOResponse][GETCUSTINFOReturn][CUST_ID].value
```

Working with XForms instances, we must adjust any XPath expressions referencing the data. Use:

```
instance('INSTANCE1')/*/*
```

in place of:

```
instance('INSTANCE1')/soap:Body/defaultns:GETCUSTINFOResponse
```

Furthermore, we observed that the Web service response message can contain the elements prepended with a namespace (for example, <defaultns:CUST_NAME> in pace of <CUST_NAME>).

Replacing the instance with this response would break the references to the fields in the UI. So, for test purposes, we changed the element names in the instance and all references to them prepending the namespace.

This was the point where we decided not to use Web services in this book as the leading solution for dynamic data gathering.

Another workaround would be a redefinition of the Web service description using an explicit RCP data structure with the object definitions shown in Example C-8.

Example: C-8 Redefined WSDL using simple data types only

```
<?xml version="1.0" encoding="UTF-8"?>
<wsdl:definitions targetNamespace="http://WPFormsRedpaper"
xmlns="http://schemas.xmlsoap.org/wsdl/"
xmlns:apachesoap="http://xml.apache.org/xml-soap"
xmlns:impl="http://WPFormsRedpaper" xmlns:intf="http://WPFormsRedpaper"
xmlns:soapenc="http://schemas.xmlsoap.org/soap/encoding/"
xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
xmlns:wsdlsoap="http://schemas.xmlsoap.org/wsdl/soap/"
xmlns:xsd="http://www.w3.org/2001/XMLSchema">
 <wsdl:types>
 </wsdl:types>
 <wsdl:message name="GETCUSTINFORequest">
  <wsdl:part name="CUST_ID" type="xsd:string"/>
 </wsdl:message>
 <wsdl:message name="GETCUSTINFOResponse">
   <part name="CUST_ID" type="xsd:string"/>
   <part name="CUST_NAME" type="xsd:string"/>
   <part name="CUST_AMGR" type="xsd:string"/>
   <part name="CUST_CONTACT_NAME" type="xsd:string"/>
   <part name="CUST_CONTACT_POSITION" type="xsd:string"/>
   <part name="CUST_CONTACT_PHONE" type="xsd:string"/>
   <part name="CUST_CONTACT_EMAIL" type="xsd:string"/>
   <part name="CUST_CRM_NO" type="xsd:string"/>
 </wsdl:message>
 <wsdl:operation name="GETCUSTINFO" parameterOrder="CUST_ID">
   <wsdl:input message="impl:GETCUSTINFORequest" name="GETCUSTINFORequest"/>
   <wsdl:output message="impl:GETCUSTINFOResponse" name="GETCUSTINFOResponse"/>
  </wsdl:operation>
 </wsdl:portType>
```

Doing so results in a completely new design of the J2EE Web service implementation class switching from accessing objects with attributes of a basic type (String, int, and so on) to work with placeholder parameters (java.lang.String placeholder, and so on). We do not take this approach. After rewriting the binding definitions stored in XFDL form for customer and product detail data, we consider the Web service implementation complete.

Implementing Web services in XForms

Using the customer data (customerInfo.wsdl) Web service, the following steps demonstrate how Web services is implemented in an XForms form:

1. Open the existing XForms form in Workplace Designer.
2. Open the **Enclosures** view and expand **WSDL**. Right-click **WebServices** and select **Enclose WSDL File**, as shown in Figure C-3.

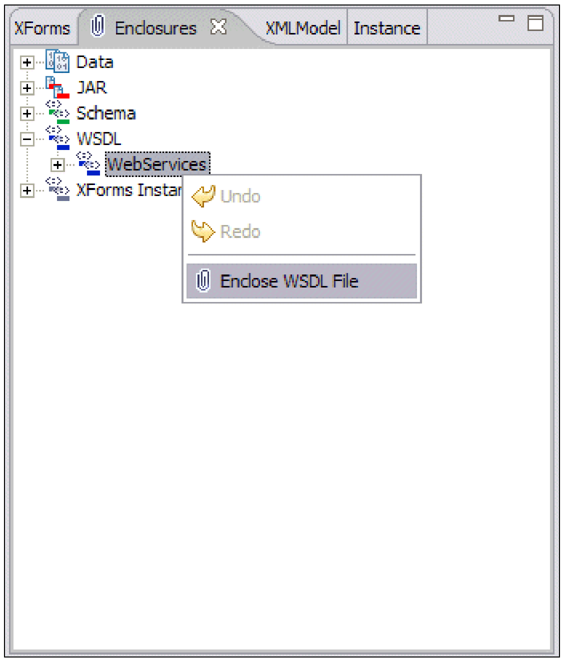


Figure C-3 Enclosures view with Enclose WSDL file right-click menu option

In the dialog box that appears, browse to the location of the Customer data WSDL file and click **Open**. Go back to the Enclosures view and expand **WebServices**. You should now see that the Customer data WSDL file has been added to the form, as shown in Figure C-4.

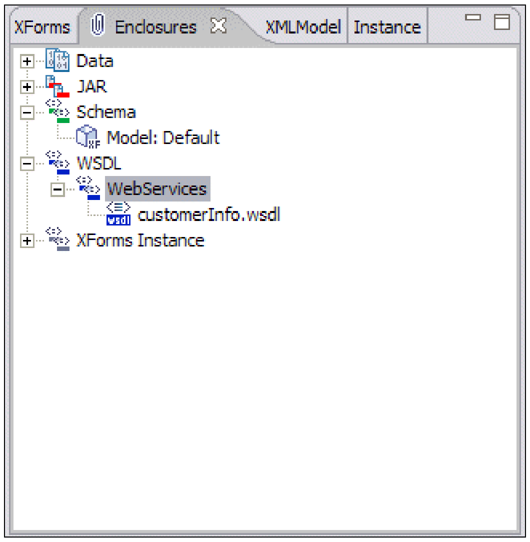


Figure C-4 Enclosures view with added WSDL file

3. XForms instances are the foundation of all XForms forms. We generate two instances for each Web service end point — one for the request parameters, and the other to store the response. These instances are generated from the WSDL that was embedded in the form in the previous step.
   a. Open the Instance view and click the **WSDL** button. This button generates an instance from the enclosed WSDL, as shown in Figure C-5.

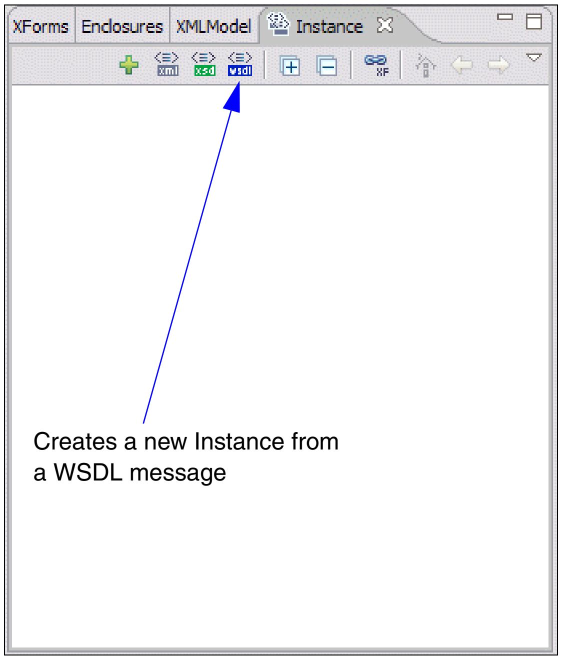
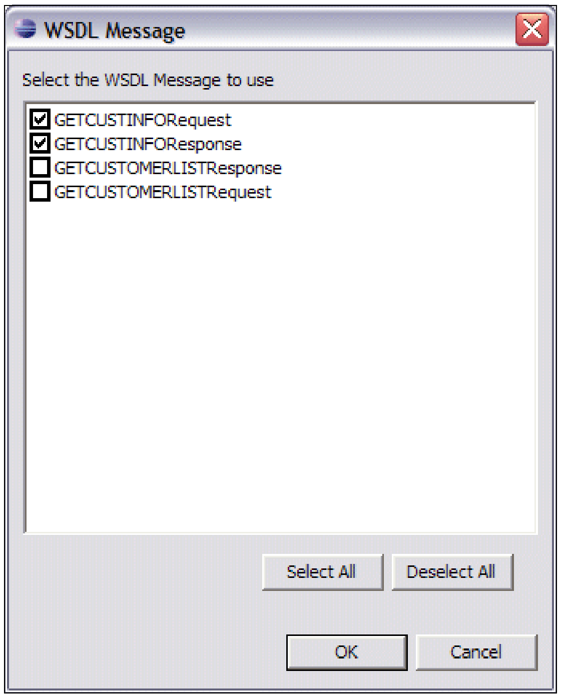


Figure C-5 Instance view

b. Select the check box for both messages **GETCUSTINFORequest** and **GETCUSTINFOResponse**, as shown in Figure C-6, and click **OK**.



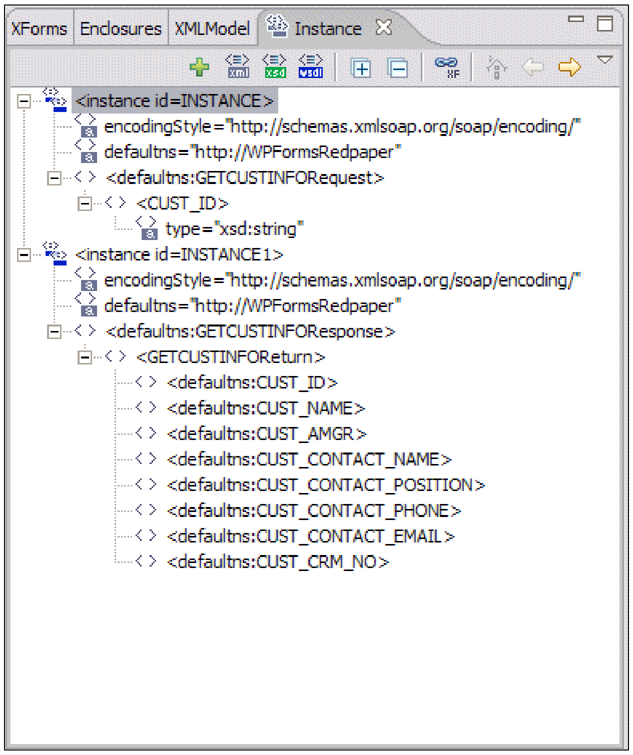
Select the WSDL Message to use

- [✓] GETCUSTINFORequest
- [✓] GETCUSTINFOResponse
- [ ] GETCUSTOMERLISTResponse
- [ ] GETCUSTOMERLISTRequest

Figure C-6 WSDL Message dialog box

4. Items need to be linked to an XForms instance.

   a. In the Instance view, expand both instances that were created from the previous step, as shown in Figure C-7.



```
<instance id=INSTANCE>
    encodingStyle="http://schemas.xmlsoap.org/soap/encoding/"
    defaultns="http://WPFormsRedpaper"
    <defaultns:GETCUSTINFORequest>
        <CUST_ID>
            type="xsd:string"
<instance id=INSTANCE1>
    encodingStyle="http://schemas.xmlsoap.org/soap/encoding/"
    defaultns="http://WPFormsRedpaper"
    <defaultns:GETCUSTINFOResponse>
        <GETCUSTINFOReturn>
            <defaultns:CUST_ID>
            <defaultns:CUST_NAME>
            <defaultns:CUST_AMGR>
            <defaultns:CUST_CONTACT_NAME>
            <defaultns:CUST_CONTACT_POSITION>
            <defaultns:CUST_CONTACT_PHONE>
            <defaultns:CUST_CONTACT_EMAIL>
            <defaultns:CUST_CRM_NO>
```

Figure C-7 Instance view

b. For the first instance, which contains the GETCUSTINFORequest WSDL message, select the **<CUST_ID>** element, hold the left mouse button, drag it over the field on the form, and release the left mouse button. This creates a *link* between the form item and the XForms instance element.

c. For the second instance, which contains the GETCUSTINFOResponse WSDL message, link the *return* elements to the fields that display the return result. For each relevant element in the instance, select the element, hold the left mouse button, drag it over the corresponding field on the form, and release the left mouse button. This creates a *link* between the form item and the corresponding XForms instance element.

5. Ensure that there is a Submit button in the form. When the Submit button is clicked, we want to call the Web service and place the result into the results field. This is accomplished by linking the button to an XForms submission:

   a. Open the **XForms** view and expand **XForms** → **Model: Default**.

   b. Right-click **Model:Default** and select **Create Submission**. The Designer creates a submission, as shown in Figure C-8.

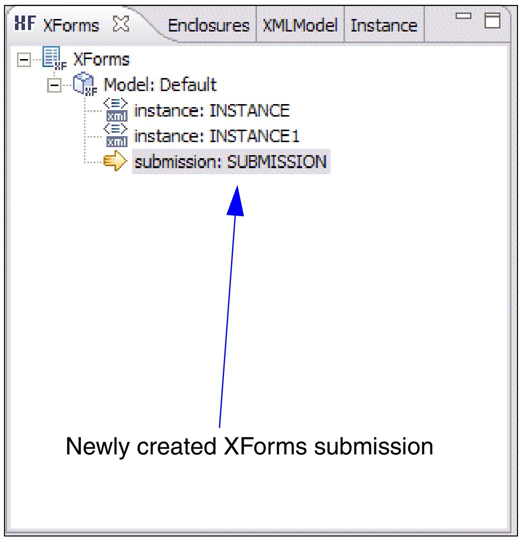


Figure C-8 XForms view with submission

   c. Select the submission in the XForms view, and open the Properties view.

   d. Expand the **XForms** category. Set the ref property to the instance that contains the request — that is, instance('INSTANCE'). This property can be set to submit an entire data instance or only a portion of the instance. When submitting only a portion of a data instance, the root element of the submission must be identified. The root element determines which portion of the instance is submitted, since only the root element and its children are sent.

   e. Set the instance property to the instance that stores the result, that is, INSTANCE1.

f. Set the action property to the URL of the Web service. The URL can be seen as part of the WSDL.

   i. The URL is http://.

      To find this URL, click the **Source** tab to open the Source view. Look for the element called wsdlsoap:address. This element has an attribute called location that contains the URL, as shown in Example C-9.

Example: C-9 WSDL code snippet showing the location URL

```
<wsdl:service name="CustomerInfoService">
                     <wsdl:port binding="impl:WPFormsCustSoapBinding" name="WPFormsCust">
                        <wsdlsoap:address
location="http://vmforms1.cam.itso.ibm.com:8085/WpfWsCustomerT/services/WPFormsCust"></wsdlsoap:
address>
                     </wsdl:port>
                  </wsdl:service>
```

   ii. Copy this URL into the action property of the XForms submission.

Note: The Designer supports both http: and https: protocols.

g. Set the method property to post. This property describes how the submission is performed. The method property can have one of three values:

- post — serializes the data and sends it as XML
- get — serializes the data and sends it as URL encoded data
- put — serializes the data and saves it as a file instead of submitting it

Note: If you are using the put method and want to save your submission as a file, you must use the file: scheme. This indicates the directory and file in which the submission will be saved, for example, file:C:\Documents and Settings\santana\xforms\instance.xml.

There are some limitations on where you can save submission data. Put submissions will fail if you try to save them to the following locations:

- The program files directory
- The system drive, the Windows directory, or the Windows system directory
- Temporary directories

A directory outside the folder subtree containing the originating file.

h. Find the mediatype property and select **application/soap+xml.** This property sets the content type of the submission.

   i. Open up the **Source** tab and find the xforms:submission entry.

   ii. Change the mediatype attribute to look like:

```
application/soap+xml;action=urn:GoogleSearchAction (in out example this
is mediatype="application/soap+xml; action=GETCUSTINFO")
```

Note: To add the action parameter to the mediatype attribute we must switch to the source code pane because the mediatype property field does not allow us to add arbitrary text.

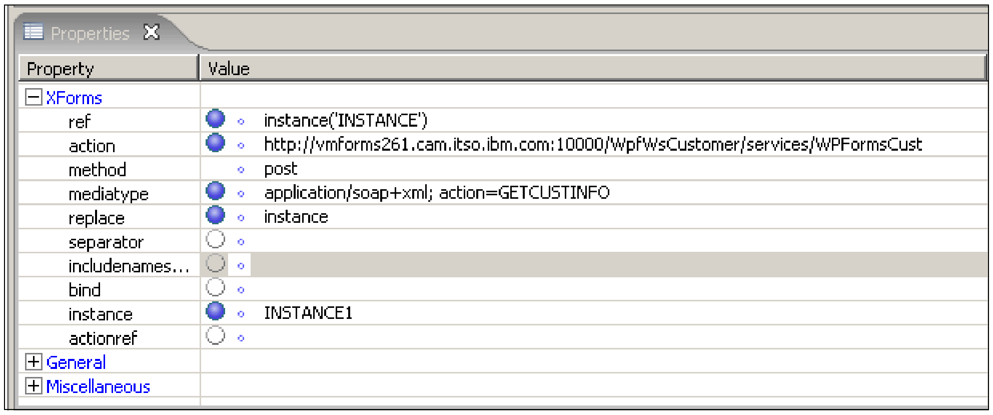
Note: To find this value, click the **Source** tab to open the Source view. Look for the element called wsdlsoap:operation, as shown in Example C-10. This element has an attribute called soapAction. It is placed in the header of the submitted request and is used to aid the Web service in determining which method has been called.

Example: C-10 WSDL code snippet showing the soapAction attribute

```
<wsdl:operation name="GETCUSTINFO">
                        <wsdlsoap:operation soapAction=""></wsdlsoap:operation>
                        <wsdl:input name="GETCUSTINFORequest">
                           <wsdlsoap:body
encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" namespace="http://WPFormsRedpaper"
use="encoded"></wsdlsoap:body>
                        </wsdl:input>
                        <wsdl:output name="GETCUSTINFOResponse">
                           <wsdlsoap:body
encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" namespace="http://WPFormsRedpaper"
use="encoded"></wsdlsoap:body>
                        </wsdl:output>
                     </wsdl:operation>
```

i. Click the **Design** tab to return to the Design view, and go to the Properties view for the submission. Expand the **XForms** category. Find the replace property and select **instance** from the drop-down box, as shown in Figure C-9. This property indicates whether the returned data should replace the entire form, a data instance, or be ignored. The replace property can have one of three values:

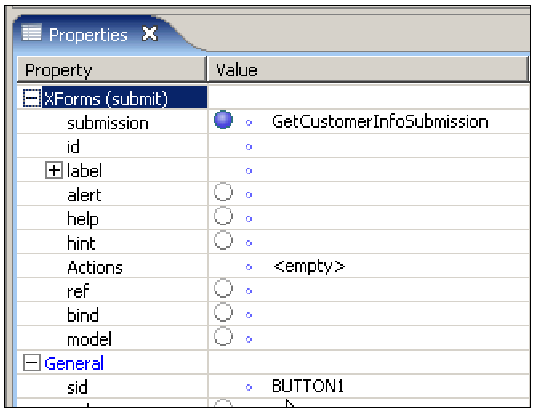
- all - The returned data replaces the entire form.
- instance - The returned data only replaces the submitted instance.
- none - The returned data is ignored.



Property	Value
XForms	
ref	instance('INSTANCE')
action	http://vmforms261.cam.itso.ibm.com:10000/WpfWsCustomer/services/WPFormsCust
method	post
mediatype	application/soap+xml; action=GETCUSTINFO
replace	instance
separator	
includenames...	
bind	
instance	INSTANCE1
actionref	
General	
Miscellaneous	

Figure C-9 Properties view for the submission

j. Select the submit button on the canvas, and open the **Properties** view. Expand the **XForms (submit)** category and set the submission property to **SUBMISSION**, which is the only item in the drop-down list, as shown in Figure C-10.



Property	Value
XForms (submit)	
submission	GetCustomerInfoSubmission
id	
label	
alert	
help	
hint	
Actions	<empty>
ref	
bind	
model	
General	
sid	BUTTON1

Figure C-10   Properties view for XForms (submit) button

Having the adjustments in place (manually changed element names in the XForms instance, altered references, and corrected operation name in the mediatype property), we can go to the Preview tab to test the Web service.

D

Additional material

This book refers to additional material that can be downloaded from the Internet as described below.

Locating the Web material

The Web material associated with this book is available in softcopy on the Internet from the IBM Redbooks Web server. Point your Web browser to:

ftp://www.redbooks.ibm.com/redbooks/SG247388

Alternatively, you can go to the IBM Redbooks Web site at:

ibm.com/redbooks

Select the **Additional materials** and open the directory that corresponds with the book form number, SG247388.

Using the Web material

The additional Web material that accompanies this book includes the following files:

File name	*Description*
Form_Page_scanned_image.jpg	Image to use as an initial starting point for building a form template.
CH5_J2EEStage1_DeployWAS6.zip	EAR file to deploy on the WebSphere Application Server (WAS) 6 containing the Web application for stage 1 (stand-alone form, no DB2 integration) and deployment information.
CH5_J2EEStage1_Dev.zip	RAD6 project as Project Interchange file ready to re-import into RAD6 Workspace containing the Web application for stage 1 (stand-alone form, no DB2 integration).

CH5_J2EEStage1_Form.zip	Sample form used in Web application for stage 1 (stand-alone form, no DB2 integration).
CH6-8_DB2Basics_DB2_Setup.zip	Setup files creating DB2 tables and initial sample data along with the setup instructions. The created database is a prerequisite for all development and demonstration tasks in Chapters 6 through 8 (J2EE stage 2, Webform Server integration, CM integration).
CH6-8_DB2Basics_DeployWAS6.zip	JAR files to deploy on XFormsSubmission Server (WAS 6) and J2EE Application server (WAS 6). They provide access to DB2 data for the Web applications created in Chapters 6 through 8.
CH6-8_DB2Basics_Dev.zip	RAD6 projects as zipped project interchange file ready to re-import into RAD6 Workspace containing the DB2 connector project. The project provides the access to DB2 data used in the Web applications created in Chapters 6 through 8.
CH6-8_J2EEStage2_DeployWAS6.zip	EAR files to deploy on WebSphere Application Server (WAS) 6 with deployment instructions. The Forms261XFormsEAR.ear file provides XFormsSubmission service used for dynamic data access in stage 2 XFDL form. The Forms261Stage2EAR.ear file contains the Web application used in J2EE stage 2 used in Chapters 6 and 8 (utilizing Forms Viewer) and Chapter 7 (utilizing Webform Server).
CH6-8_J2EEStage2_Dev.zip	RAD6 project as zipped project interchange file ready to re-import into RAD6 Workspace containing the Web application used in Chapters 6–8 (J2EE stage 2 and Webform Server integration) and the XFormsSubmission service for dynamic data gathering from the XFDL form.
CH6-9_J2EEStage2_Form.zip	Workplace Forms templates used in Chapters 6–9 (J2EE stage 2) working with data prepopulation, Web services, and data extraction.
CH9_Domino_Deploy.zip	Domino databases and ProcessXFDL servlet to deploy on Domino server along with deployment instructions, WebFormServerUploadEAR.ear file to deploy on WAS 6 server for use case 3.2 (Webform server integration with Domino).
CH9_Domino_Dev.zip	Source code for ProcessXFDL servlet, servlets.properties file, and CH9_Domino_WFServer_Dev.zip file. The zip file is a RAD project interchange file ready to re-import in RAD6 containing the project for the supporting Web application utilized in use case 3.2 (Webform server integration with Domino).
ApB-IFX-Deploy.zip	JAR file containing three IFX functions packed in two different packages ready to deploy in a Viewer/Webform Server extensions directory or to

	enclose in a form as discussed in Appendix B, “Writing Form extensions - IFX” on page 661.
ApB-IFX-Dev.zip	RAD6 project interchange file containing the RAD project for IFX development (as discussed in Appendix B, “Writing Form extensions - IFX” on page 661) ready to re-import in a RAD6 development environment.
ApF-WebServices-DeployWAS6.zip	JAR files and EAR file to deploy on WAS6 server to serve XFDL forms utilizing data gathering via Web services discussed in Appendix C, “Web services” on page 673.
ApF-WebServices-Dev.zip	RAD 6 project interchange file containing the RAD project for the DB2 connection layer and the Web service providers for Web services discussed in Appendix C, “Web services” on page 673.
ApF-WebServices-Form.zip	XFDL forms used for Web service tests against Domino and WAS-based Web service provider.
RAD_Development_all_Chapters.zip	RAD6 project interchange file containing all J2EE projects created in this book and a text file Server-URLs.txt collecting all URLs used to access the created components.

Related publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this book.

IBM Redbooks

For information about ordering these publications, see "How to get IBM Redbooks" on page 698. Note that some of the documents referenced here may be available in softcopy only.

- *IBM Workplace Forms: Guide to Building and Integrating a Sample Workplace Forms Application*, SG24-7279

Other publications

These publications are also relevant as further information sources:

- *XFDL: Creating Electronic Commerce Transaction Records Using XML*: Barclay T. Blair and John Boyer

  `http://www8.org/w8-papers/4d-electronic/xfdl/xfdl.html`
- D'Anjou, Jim; Fairbother, Scott; Kehn, Dan; Kellerman, John; McCarthy, Pat. *The Java Developer's Guide to Eclipse*. Second Edition. Addison-Wesley. Boston. 2005
- Carlson, David. *Eclipse Distilled*. Addison Wesley Professional. Boston. 2005

Online resources

These Web sites are also relevant as further information sources:

- XFDL specification

  `http://publibfp.boulder.ibm.com/epubs/pdf/22915350.pdf`
- IBM Workplace Forms trial version

  `http://www-128.ibm.com/developerworks/downloads/wp/wpforms/`
- Eclipse home page

  `http://www.eclipse.org/`
- Workplace Forms XFDL Specification document

  `http://www-128.ibm.com/developerworks/workplace/documentation/forms/#5`
- Workplace Forms documentation

  `http://www-128.ibm.com/developerworks/workplace/documentation/forms/`
- Ajax documentation

  `http://developers.sun.com/ajax/documentation/`

- *Embedding the Viewer in HTML Web Pages*

  http://www.elink.ibmlink.ibm.com/publications/servlet/pbi.wss?CTY=CA&FNC=SRX&PBL=S325-2598
- IBM Workplace Forms integration sample for IBM WebSphere Portal

  http://www-128.ibm.com/developerworks/workplace/library/d-wp-forms-portal/

How to get IBM Redbooks

You can search for, view, or download Redbooks, Redpapers, Hints and Tips, draft publications and Additional materials, as well as order hardcopy Redbooks or CD-ROMs, at this Web site:

ibm.com/redbooks

Help from IBM

IBM Support and downloads

ibm.com/support

IBM Global Services

ibm.com/services

Index

IBM Workplace Forms 2.6: Guide to Building and Integrating a Sample Workplace Forms Application

IBM Workplace Forms 2.6 Guide to Building and Integrating a Sample

Designing with XForms Model

Features and functionality

Integration

This IBM Redbooks publication describes the features and functionality of Workplace Forms 2.6 and each of its component products. After introducing the products and providing an overview of features and functionality, we discuss the underlying product architecture and address the concept of integration.

To help potential users, architects, and developers better understand how to develop and implement a forms application, we introduce a specific scenario based on a sales quotation approval application. Using this base scenario as a foundation, we describe in detail how to build an application that captures data in a form, then applies specific business logic and workflow to gain approval for a specific product sales quotation.

Throughout the scenario, we build upon the complexity of the application and introduce increasing integration points with other data systems. Ultimately, we demonstrate how an IBM Workplace Forms application can integrate with WebSphere Portal, IBM DB2 Content Manager, and Lotus Domino.

This book is a sequel to the original IBM Workplace Forms book, *IBM Workplace Forms: Guide to Building and Integrating a Sample Workplace Forms Application,* SG24-7279.

SG24-7388-00 ISBN 0738486388